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The Institute of British Foundrymen
The Institute of Vitreous Enamellers
The Welsh Engineers' and Founders' Association
The Foundry Trades' Equipment and Supplies Association

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New York Convention Papers—II

In our issue of July 10 we commented upon the Papers presented to the New York Convention of the American Foundrymen's Association in so far as they related to innovations in sand technology and steel foundry practice. This article continues our observations on the contributions in the field of grey and malleable iron. An ambitious programme of research on cupola practice having been initiated by the A.F.A., it was a prerequisite to have available for the use of the Committee and investigators full knowledge of published data. The Germans, Poles, and Czechs have carried out much work of a purely theoretical character, which because of the method of presentation was difficult, if not impossible, of practical application. A summary of these researches has been made by Mr. S. C. Massari and Mr. R. W. Lindsay; moreover, this work has been done so intelligently as to make it readily understandable—and therefore applicable—by the average foundry technician. Starting out with the premise that the properties of any grey iron are wholly dependent on the structure, Mr. R. A. Flinn and Mr. D. J. Reese have, in a Paper entitled "The Development and Control of Engineering Grey Cast Irons," further reduced the problem to the simplest proportions by detailing (1) the effect of change in the graphite structure, and (2) in the ferrous background or matrix. These factors assumed, methods are disclosed for producing and controlling the most desirable of them, including the new acicular structures, yielding tensile strengths up to 46 tons per sq. in. Comparison of this Paper with those of McRae Smith is useful as throwing into sharp relief the potentialities of the new field now open to enlightened foundrymen. Further light on this particular subject is shed by Mr. John T. Eash in his Paper on the "Effect of Ladle Inoculation on the Solidification of Grey Cast Iron." Arising from his researches is the statement that the iron-graphite eutectic temperature is 20 to 38 deg. C. higher than the iron carbide eutectic in slowly-cooled heavy sectioned, low carbon grey iron castings. The former eutectic is to be associated with low carbon cast irons inoculated with graphite. The most important factor in most matters, be it politics, war or metallurgy, is that of time. Thus it is not surprising that it forms the basis of a research on the undercooling of grey cast iron by Mr. Alfred Boyles and Dr. C. H. Lorig at the Battelle Memorial Institute. Inoculated cast iron was tested after casting two minutes and half an hour after "seeding." The results, studied from the purely physical angle, are as interesting as they are informative. The results of this research can be profitably studied in conjunction with a Paper submitted by Mr. S. C. Massari and Mr. R. W. Lindsay on "Some Factors Influencing the Graphitising Behaviour of Cast Iron." Being associated with the chilled iron wheel industry, the accidental introduction of extraneous matter into the white iron used in this industry was found, as was no doubt suspected, markedly to reduce the depth of chill. Superheating, which of course can be related to the time factor, increases the depth of chill.

Heat-treating iron castings and the heat-treatment of cast iron are by no means synonymous terms. Much more work of the type described by Mr. C. A. Nagler and Dr. Ralph L. Dowdell requires to be done before a universally accepted technique can be established. Working with a plain and a comparable 1 per cent. molybdenum iron, a comparison, using diverse heat treatments, between the hardness values and micro structure has been obtained. Three major problems relating to malleable cast iron were discussed in four Papers devoted to this important section of foundry practice. Because of its comparative novelty and immediate industrial interest, the Paper on the flame hardening of malleable cast iron by Mr. Stephen Smith commands attention. A controlled depth of hardness associated with a tough ductile core appeals to us as representing a material of exceptional interest to the engineer. Slag control when making malleable by a cupola-air furnace duplexing process has resulted in an improved product. The details of this system employed are described by Mr. G. A. Schumacher with such clarity that they can easily be emulated by any foundry operating this method. Endeavours to reinforce the knowledge of what happens during the annealing of malleable iron castings were made in two Papers, "The Velocity of Conversion of Austenite into Ferrite and Cementite," by Dr. H. A. Schwartz and Mr. M. K. Barnett, shows that there is an interval, *circa* 725 to 750 deg. C., applicable to most malleable cast irons, wherein graphitisation is about ten times as fast as just above and a hundred times as fast as just below. Finally Mr. N. A. Ziegler, Mr. W. L. Meinhart and Mr. A. J. Deacon, in a Paper entitled "Graphitisation of Cementite in

(Continued overleaf, col. 1.)

Changing Scrap Situation

BY "ONLOOKER"

As the public has had ample opportunity to realise, the control of commodity prices may easily cut both ways and in protecting the consumer against profiteering the scheme may result in the virtual disappearance from the market of the article which is being controlled. This sort of thing cannot of course happen when the authority which fixes the selling price is also the sole purveyor, provided also that arrangements have been made for the acquisition of supplies in proper volume. In copper, lead and zinc, for example, the Ministry of Supply sells to users at certain maximum prices, but in order to do this contracts have been made with producers so that there is no doubt about the necessary tonnage coming forward. Scrap however is a different story and here the subject of control presents difficulties which are not apparent in the virgin metal situation. In the first place the conduct of business in old metals is left in the hands of merchants and others, who, provided that they observe the rules and regulations of the Control Order, may carry on to their hearts' content without any interference from the powers that be. Implicit in the scheme however is the principle of maximum prices arranged to cover certain representative types without trying to name an upper limit for every conceivable grade in the long list of scrap material.

In the opinion of many the ceiling for most of the grades of scrap enumerated in the official list was fixed too high, but doubtless the authorities, bearing in mind the vital need for every ton to be made available for use in the war effort, were anxious to provide every encouragement to the holders to part with their accumulations. After the upward revision of prices in December, 1939, secondary metal began to come out more freely, but it soon became evident that the manufacturers, contractors and others who had material to dispose of were determined to have the maximum price and not a penny less. To this there had to be added carriage to works, handling charges, etc., so that by the time the material was offered by the merchant to the consumer a position had arisen in which there was precious little margin between the price of scrap and the value of virgin metal. Naturally enough this did not please the users much, but at that time supplies of new metal were not too plentiful and most fabricators felt, too, that they ought in the national interest to absorb as much scrap as they could in their processes.

There are those who say that maximum prices for scrap ought never to have been instituted; be that as it may the past eighteen months have undoubtedly shown weaknesses in the control scheme while the first holders or producers of scrap have done themselves very well in making sure of the maximum return for their material. Now it would seem as if the pendulum were swinging in the other direction, for consumers are displaying a considerable measure of indifference to the acquisition of old metal except at their own valuation, which it may be said at once is not the permitted maximum. In this attempt to break down what may be called a "sellers' market," the consumers are being assisted by the fact that certain types of scrap are at the moment very plentiful and in consequence holders have been obliged to part with their metal at prices a long way below the upper limit under the Order. For a long time past the lower grade residues have presented a serious disposal problem and values have diminished in some cases almost to vanishing point, but now that supplies of some classes of "specification" scrap are outrunning demand an entirely new atmosphere is being created. The consumers are in fact beginning to establish their idea of values and this, as already mentioned, is not in line with the schedule of maximum prices permitted under the Ministry of Supply Order. The interim stage may be a little difficult but in due course scrap ought to flow more freely.

(*Continued from previous page.*)

Cupola White Iron," have disclosed data which materially widen the range of physical properties of malleable castings through the adjustment and regulation of the annealing cycle. It is a detailed study which has yielded good information on growth and many cognate subjects.

Correspondence

[*We accept no responsibility for the statements made or the opinions expressed by our correspondents.*]

To the Editor of THE FOUNDRY TRADE JOURNAL.

The Future of the Foundry Industry

SIR,—Recently it was my pleasant experience to read the presidential address given by Major Richard Miles to the Institute of British Foundrymen.

As a layman and unconnected with the foundry world, I would like to congratulate Major Richard Miles. His address was very far-seeing, and conveyed a message to the whole world. It was most refreshing to hear such economically sound and relevant logic emanating from a gentleman who has the welfare of the Institute of British Foundrymen at heart, and I would like to wish Major Miles every success during his term of office.

Security is a jewel of happiness that should be within the grasp of every one of us, and Major Miles's reasoning points the way.—Yours, etc.,

FREDK. WM. ROSE.

32, Sunray Avenue,
Bromley, Kent.
July 21, 1941.

Potato Peeler Components

From time to time we receive inquiries as to the best way of making an abrasive adhere to the cast iron. "The Foundry" gives the following details of a process used for making safety treads, which may be largely applicable.

The abrasive used may be either silicon carbide or aluminium oxide, and the grain size may range from 12 to 30 mesh, depending upon the coarseness of surface desired. General practice is to place the abrasive on the drag face, and the procedure is to first spray the sand face with some type of binding agent which may be a thin solution of sodium silicate (water-glass), clay wash, molasses, etc. Then the abrasive is put in place by screening or sieving a thin layer over the mould surface. The screen or sieve used should be the same mesh size as the abrasive to ensure proper distribution.

Then the mould surface with its coating of abrasive is torch dried to ensure that all moisture is driven off. If desired, a second thin layer of abrasive can be applied in the same manner, or it may be placed directly over the first before drying—using the binding agent in any case. After drying the mould is ready to be poured, and the metal should be as hot as possible to ensure proper penetration between the abrasive grain and to cause a partial fusion between abrasive and binding agent. If bronze be the basic alloy, it is believed that a slight excess of phosphorus above that required for deoxidation will give better results due to greater fluidity and penetration or searching tendency.

Random Shots

In the weekly quiz of the current "Sunday Times" the reader was asked to define "a horse's neck," "a dog's nose," and "Turk's blood." It is just another sign of the times when it is presupposed that a man has forgotten what such names stand for. And, indeed, who could now look a barmaid straight in the eye and unflinchingly order brandy and ginger ale, beer and gin, or, even worse, burgundy and champagne?

* * *

That those who are concentrating on war production occasionally need a tonic is not to be denied, and for this the Editor evidently recommends a week-end conference in Manchester. "Marksman," on the other hand, hears of other pick-me-ups, just as ingenious yet neither so expensive nor so disrupting to the even routine of daily life. One consists of Guinness and tomato juice mixed in equal parts. Pour the juice into the Guinness gently, allowing the dense dark red fumes given off to disseminate slowly into the surrounding atmosphere. Note how the bar during this operation gradually empties, thus relieving one of the necessity of ordering drinks all round. For those who cannot take anything so potent, a good wartime nerve tonic is recommended by taking one part cold cocoa (stolen from the nursery supper table) and mixing with it one part of red herring juice. This should both look and taste like cupola patching. "Marksman" has even heard of cold weak tea, well iced, and served with a *soupçon* of sugar and lemonade crystals, making a refreshing drink, but this is rejected as not being likely to appeal to either melter, moulder, or metallurgist. There is, however, now commercially available (at a reasonable price) a good quantity of pure cementite, and it has been suggested that this might form an excellent base for a new style cocktail. It is exceedingly reactive, and its very name suggests that the reaction might be of the right type.

* * *

The victory V campaign is reviving stronger memoirs of "Marksman's" sweetie eating days; days so long past that it is difficult to remember much beyond the fact that he who could afford fourpence a quarter for his sweets was an aristocrat of the first order, whilst the ordinary plebeian normally paid twopence a quarter. Anything under that price was classed as "spice" and was despised as such by discerning parents who valued the teeth and stomach of their offspring. The offspring, of course, accepted anything that came to hand. Surely somewhere amongst the vast selection available in those days there were some known as "Victory V" gums? If they are still made, what avenues have suddenly been opened up to manufacturers to identify themselves with this splendid movement!

* * *

Incidentally, the Germans are trying to steal the idea of the campaign for themselves, but by declaring that the V stands for Viktoria, they have not shown very much ingenuity. They might have done the job properly by stealing the title "Fünf Club" from Mr. Gardom & Company, who originated the idea during one Düsseldorf Congress. It is true that the sole function of that club was the ordering, drinking and deciding who should pay for the fünf beers required at every sitting, but it was a victory club all the same, for he who showed a five-pfennig piece scored a distinct victory over the one who could not, in so much that the other fellow had to buy drinks all round.

"MARKSMAN."

The Institute of British Foundrymen

ANNUAL GENERAL MEETING

The thirty-eighth annual meeting of the Institute of British Foundrymen was held at the Midland Hotel, Manchester, on Saturday, July 12. Mr. W. B. Lake, J.P., the retiring President, took the chair.

Minutes

MR. C. H. KAIN proposed, and MR. R. STUBBS seconded, that the minutes of the Annual General Meeting held in London on June 12, 1939, be taken as read and approved. The motion was carried unanimously.

Council Report, 1940-41

The report of the Council for 1940-41 had been circulated among the members, and upon the proposition of the PRESIDENT, seconded by MR. H. WINTERTON, Past-President, was adopted unanimously.

TABLE I.—*Changes in Membership*, 1940–1941.

	Subscribing firms.	Members.	Associate members.	Associates.	Associates (students).	Total.
At April 30, 1940	78	996	1,122	130	37	2,363
Additions and transfers from other grades	1	29	76	6	2	114
	79	1,025	1,198	136	39	2,477
Losses and transfers to other grades ..	2	53	73	23	9	160
	77	972	1,125	113	30	2,317

ANNUAL REPORT OF COUNCIL

This Report covers the period May 1, 1940, to April 30, 1941. The Statement of Accounts for the year ended December 31, 1940, and the Balance Sheet at that date are also included.

Finance

In spite of the difficulties associated with the operation of the Institute's activities during war time, these activities have been fairly well maintained. There has, however, been some curtailment of work, and this factor, together with the careful regulation of General Office expenditure and the satisfactory subscription revenue, has resulted in a surplus on the year's working of £650. This is the most substantial credit balance which the Institute has enjoyed. Out of this balance it is proposed to set aside £250 to form a special fund to be known as the Charter Reserve Fund from which will be met the additional charges to be incurred when the Institute renews its application for a new Charter at the conclusion of hostilities.

Membership

From Tables I and II it will be seen that there has been a slight decline in membership during the period under review.

It is with regret that the Council records the death of twenty-four members during the year. Amongst those who were widely known are the following:—

Prof. Sir H. C. M. Carpenter, M.A., Ph.D., F.R.S., A.R.S.M., an Honorary Life Member, who joined the Institute in 1919. His contributions to the knowledge of metals are, of course, well known. In spite of the many other calls upon his time, he always showed a keen interest in the Institute's affairs, and for the last four years of his life was a joint assessor, with Sir William Larke, of the E. J. Fox Gold Medal.

Sir Robert A. Hadfield, Bt., F.R.S., was elected an Honorary Life Member in 1910, and throughout his long association with the Institute he maintained a very great regard for and high appreciation of its activities and particularly its publications. His scientific attainments made him one of the country's foremost metallurgists, and the Institute and industry mourn his passing.

Mr. E. L. Rhead, M.Sc.Tech., F.I.C., F.C.S., was also an Honorary Life Member, being elected in 1919. He was widely known and greatly respected, particularly in the Lancashire area. His book on "Metallurgy" rapidly became a standard work of reference, and his many other contributions to scientific literature will long be remembered.

Mr. S. G. Smith became a member of the Institute in 1909 and was a Past-President of the Lancashire Branch. He made many scientific and practical contributions to the Institute's "Proceedings," and in this connection was awarded a Diploma. In recognition of his outstanding work, particularly on the educational side, he was elected an Honorary Life Member in 1935.

Mr. Victor Stobie, M.I.E.E., joined the Newcastle Branch of the Institute as an Associate Member in 1912, but transferred to Membership in 1925. He was a Past-Branch-President, and was elected President of the Institute in 1932. He was a pioneer of electric furnace steelmaking, and had contributed much to the knowledge and literature of this particular aspect of foundry science during his long membership. Apart from his scientific contributions to the "Proceedings," he was a prominent member of the Council for a considerable time, and greatly assisted in the administrative work in this capacity.

Mr. F. E. McGrah, who died as a result of a motoring accident in the autumn of 1940, joined the Sheffield Branch in 1918.

Mr. R. A. Miles, a Past-President of the Lancashire Branch which he joined in 1916, had for many years served on the Council of the Institute, and was so serving at the time of his death. He rendered outstanding service to the Institute, and particularly to the Lancashire Branch.

Mr. J. B. Allan, M.A., did not join the Sheffield Branch of the Institute until 1928, but during his comparatively short period of membership he became widely known both in Sheffield and elsewhere. He became President of the Sheffield Branch in 1937, and was largely responsible for the organisation of the Patternmaking Competition which is now held annually by that Branch.

Mr. J. A. Laing, the co-author with Mr. R. T. Rolfe of a number of well-known books on foundry practice, joined the London Branch in 1933, but transferred to the Lancashire Branch a few years later. He contributed a number of Papers to the Branches, for one of which he was awarded the Institute's Diploma.

Mr. W. R. Wilson was one of the members of longest standing, for he joined the Institute in 1904, the year of its formation. He was widely known, particularly among Lancashire members.

The following are amongst those members who have been honoured during the period covered by this report:—

Mr. G. E. France, who was re-elected President of the Foundry Trades' Equipment and Supplies Association.

Mr. A. H. Guy, of South Africa, who was elected President of the South African Red Cross Society.

Dr. W. H. Hatfield, F.R.S., who was elected President of the Sheffield Society of Engineers and Metallurgists, and who has also been elected to the Council of the University of Sheffield.

Dr. Andrew M'Cance, who was awarded the Bessemer Gold Medal of the Iron and Steel Institute in 1940.

Mr. F. A. Melmouth, who received the Joseph S. Seamen Gold Medal of the American Foundrymen's Association.

Prof. Albert M. Portevin, an Honorary Life Member, who was elected an Honorary Member of the Institute of Metals.

Mr. W. J. Rees, Convenor of the Refractories Sub-Committee of the Technical Committee, who had conferred upon him the degree of D.Sc. (Tech.) in the University of Sheffield.

Mr. Frank Russell, who was elected President of the Yorkshire Firebrick Association.

Dr. T. Swinden, who has been awarded the Bessemer Gold Medal of the Iron and Steel Institute for 1941.

Awards

E. J. Fox Gold Medal.—On the recommendation of the Assessors, Sir W. J. Larke and the late Prof. Sir Harold Carpenter, the E. J. Fox Gold Medal for 1940 was awarded to Mr. W. J. Dawson, of Sheffield, "in recognition of his services to the industry as Chairman of the Steel Castings Research Committee, and in other capacities."

Oliver Stubbs Gold Medal.—The Oliver Stubbs Gold Medal for the year 1940 was awarded to Mr. A. E. Peace (East Midlands Branch), a member of the Council of the Institute, a Past-Branch-President and holder of the Institute's Diploma, "in recognition of the many valuable Papers which he has presented to the Branches of the Institute and at Annual Conferences, and in recognition of the consider-

TABLE II.—*Analysis of Membership at April 30, 1941.*

Branch.	Subscribing Firms.	Members.	Associate Members.	Associates.	Associates (students)	Total.
Birmingham	8 (8)	160 (160)	160 (157)	16 (16)	6 (8)	350 (349)
East Midlands	5 (4)	80 (70)	110 (97)	5 (3)	2 (2)	202 (176)
Lancashire	13 (14)	119 (133)	196 (209)	22 (27)	2 (1)	352 (384)
London	10 (10)	205 (205)	132 (121)	3 (3)	— (—)	350 (339)
Middlesbrough	1 (1)	31 (30)	45 (48)	8 (8)	5 (7)	90 (94)
Newcastle	6 (6)	30 (32)	26 (27)	41 (55)	7 (11)	110 (131)
Scottish	7 (7)	91 (90)	191 (193)	3 (4)	1 (1)	293 (295)
Sheffield	6 (7)	87 (97)	62 (68)	2 (2)	— (1)	157 (175)
South African	13 (13)	45 (46)	35 (32)	9 (9)	— (—)	102 (100)
Wales and Monmouth..	3 (3)	46 (49)	50 (53)	— (—)	7 (6)	106 (111)
W.R. of Yorks. ..	4 (4)	58 (57)	98 (95)	4 (3)	— (—)	164 (159)
Unattached	1 (1)	20 (27)	20 (22)	— (—)	— (—)	41 (50)
	77 (78)	972 (996)	1,125 (1,122)	113 (130)	30 (37)	2,317 (2,363)

Figures in brackets are totals at April 30, 1940.

Annual General Meeting of I.B.F.

able experimental work which he has carried out as Convenor of the Malleable Cast Iron Sub-Committee of the Institute's Technical Committee."

The Meritorious Services Medal.—The 1940 award of the Meritorious Services Medal was made to Mr. John Bell "in recognition of his valuable services to the Institute, particularly as honorary secretary of the Scottish Branch, which position he has held for seventeen years."

Diplomas.—Diplomas were awarded to the following members during the year:—Mr. A. Hopwood; Mr. A. J. Shore; Mr. J. A. Laing; Mr. H. G. Hall; Mr. A. Marshall; Mr. F. G. Jackson; Mr. R. C. Tucker, M.A.; Mr. J. L. Francis, A.M.I.Mech.E.; Mr. E. W. Dowson.

John Surtees' Memorial Competition.—The examinations for the award of the John Surtees' Medals and Prizes are held alternately by the Scottish and Newcastle Branches.

The 1941 Competition, due to have been organised by the Newcastle Branch, was not held owing to war conditions.

Edward Williams' Lecture

In view of the situation created by the war, the Council felt it inadvisable to seek an author to present the fifth Edward Williams' Lecture. No lecture was, therefore, presented in 1940.

Annual Conference

The Thirty-Seventh Annual Conference, which under normal conditions would have been held in Middlesbrough, was arranged to be held at Cheltenham, and was to have been of two days' duration—June 7 and 8, 1940. The war situation which developed immediately prior to that time, dictated the cancellation of this meeting, and also the Annual General Meeting, which would have been held concurrently.

Subsequently His Majesty's Privy Council gave permission to the Institute to dispense with the holding of its Annual General Meeting during the present war period, and authorised the Council, during the war, to re-elect officers to the offices which they occupied in 1940. The Council availed itself of the Privy Council's authority, and no Annual General Meeting was held during 1940.

Branch Activities

Four of the Branches have carried out normal programmes of technical meetings and, with the exception of two, all the remaining Branches have organised some meetings for the presentation and discussion of Papers. Some Branches are transferring their meetings from the winter to the spring and early summer in order to overcome the difficulties associated with the black-out. Other Branches have transferred their meetings from week-day evenings to Saturday afternoons. These changes, together with the fact that the majority of those in the industry are working exceptionally long hours, have reflected to some extent on attendances at meetings.

The Council desires to express its appreciation of the work done by Branch Councils and secretaries, without whose co-operation it would have been impossible to maintain so successfully the Institute's activities.

The Council also wishes to congratulate the South African Branch, which, continuing the steady progress it has made since its inception, issued in 1940 a volume of its own Proceedings for 1938-40.

Educational Work

The following are the results of the examinations held under the auspices of the City and Guilds of London Institute and in conjunction with this Institute, in April and May, 1940.

	No. of candidates.	Pass 1st class.	Pass 2nd class.	Percentage of passes.
Patternmaking—Intermediate grade	45	8	23	68.9
Patternmaking—Final grade ..	18	5	6	61.2
Foundry practice and science	42	15	15	61.5

PATTERNMAKING—INTERMEDIATE GRADE.

John Lawrence Younger, Gloucester Technical College: Bronze Medal of the City and Guilds of London Institute.

PATTERNMAKING—FINAL GRADE.

Ronald Hollingworth, College of Technology and Arts, Rugby: Silver Medal of the City and Guilds of London Institute.

FOUNDRY PRACTICE AND SCIENCE.

Thomas Joseph Parker, Department of Applied Science, University of Sheffield: Bronze Medal of the City and Guilds of London Institute.

Buchanan Medals and Book Prizes were awarded to:—

PATTERNMAKING—FINAL GRADE.

Ronald Hollingworth, College of Technology and Arts, Rugby: Buchanan Book Prizes.

Lancelot Bell, Constantine Technical College, Middlesbrough: Buchanan Book Prizes.

FOUNDRY PRACTICE AND SCIENCE.

Frank Lord, Accrington Technical and Art School: Buchanan Silver Medal.

T. J. Parker, Department of Applied Science, University of Sheffield: Buchanan Book Prizes.

J. L. Younger, Gloucester Technical College: Buchanan Book Prizes.

C. Webster, Keighley Technical College: Buchanan Book Prizes.

Kindred Institutions

The cordial relations existing between the Institute and kindred Societies continue, although comparatively few joint meetings have been arranged. The close associations which the Institute enjoyed with other Institutions overseas have, of course, been largely suspended. A happy exception has been the American Foundrymen's Association, with whom constant touch is maintained.

Publications

Volume XXXIII of the "Proceedings" was published at the beginning of April, 1941, in the new style adopted for the previous volume. It will have been noticed that a more modern type face has been chosen. The volume is smaller than that published in 1940, due to war-time restrictions in the consumption of paper, but contains about the same amount of matter as volumes published during the few years previous to 1940.

The British Cast Iron Research Association

The work of the British Cast Iron Research Association is almost wholly directed to assisting the national war effort, and the works of members are either fully engaged in this direction or are rapidly adapting themselves for the purpose. Details cannot, of course, be given while the war is in progress. The Council has been gratified to learn that the award of the E. J. Fox Medal for 1941 will be made to Mr. P. Pritchard, a Vice-President of the Association.

Council

Three meetings of the Council and nine meetings of the Executive and other standing Committees have been held in Birmingham, Derby and Manchester. Of the ten members of the Council who are elected by ballot for a period of two years, five retire each year. Those who retire at the Annual General Meeting to be held in Manchester on July 12 are:—Mr. V. Delport, Mr. E. Longden, Mr. H. J. Roe, Mr. P. A. Russell, and Mr. A. W. Walker. These gentlemen offer themselves for re-election and are eligible for re-election for a further period of two years.

Officers

The Council has unanimously decided to recommend that Major R. Miles, M.Eng. (Middlesbrough), be elected President, and that Mr. D. H. Wood (Birmingham) be elected Senior Vice-President. These recommendations will be placed before the Annual General Meeting on July 12, 1941.

The Council wishes to express its thanks to Mr. S. H. Russell, Past-President and Honorary Treasurer, for the careful manner in which he has conducted the finances of the Institute.

The Council is also indebted to Mr. J. W. Gardom for his work as Convener of the Technical Committee. During the past year the Technical Committee has made and continues to make important contributions to the war effort. Much of the work is of a confidential nature and details may not be given of this work. The Council desire it to be known, however, that through Mr. Gardom and various Sub-Committees of the Technical Committee the Institute is able materially to contribute to the national cause.

Annual Conference

The Council has considered the advisability of holding an annual meeting, and has decided to combine two technical sessions with the formal Annual General Meeting. By this means it is hoped to provide not only a technical and business session for all members, but an opportunity to renew acquaintanceships which war-time conditions make it difficult to maintain. For the convenience of the majority of the members who do not wish to be away from their businesses for more than a short time, the whole programme has been included in one day. The meetings will be held at the Midland Hotel, Manchester, on Saturday, July 12, 1941.

W. B. LAKE,
President.

J. BOLTON,
Assistant Secretary.

April 30, 1941.

Ninth Annual Report of the Technical Committee

Only one meeting of the full Technical Committee has been held during the past year, but many of the Sub-Committees have been actively engaged upon the solution of war-time problems. There has also been close co-operation with various Government departments, notably the Ministry of Supply (Iron and Steel Control), and with the Department of Scientific Research of that Ministry.

Three members of the Technical Committee, Mr. J. W. Gardom (Convener), Mr. P. A. Russell, B.Sc. (Convener of the Cast Iron Sub-Committee), and Mr. E. Longden, A.M.I.Mech.E., have been elected to serve on the Director for Iron Castings' Technical Advisory Panel, as the result of an invitation sent to the Institute by the Director.

At the invitation of the Director for Iron Castings, the Technical Committee is assisting very considerably, in an advisory capacity, in the production problems associated with a new armament component, and for this purpose a special staff of technicians has been temporarily employed by the Institute. Arrangements have been made whereby the cost of this work will not be borne by the Institute's funds.

Through representatives elected to various of the British Standards Institution's Technical Committees, the Institute has been able to play

Annual General Meeting of I.B.F.

its part in the important war-time specificational functions which have been fulfilled by that Institution.

Numerous technical inquiries from members have been answered during the year. The Technical Committee is anxious to assist members in this way, and invites them to refer their problems to the Committee.

J. W. GARDOM,
Convener.

Balance Sheet

The PRESIDENT called upon the hon. treasurer, Mr. S. H. Russell, to present the balance sheet and statement of accounts for the year ended December 31, 1940. MR. S. H. RUSSELL stated that, with regard to the income and expenditure account, he wished to point out that on the expenditure side practically every item indicated was smaller than in the previous year. This was due to more or less obvious reasons, in that the activities, both of the Institute and of the Branches, had been restricted owing to war conditions. The only item which showed any substantial increase was in respect to the expenses of the proposed Cheltenham Conference, which, very unfortunately, had to be cancelled at the last moment. Expenses amounting to £37 odd had been incurred and had to be met, while, of course, there were no receipts to set off against them.

On the income side, with regard to subscriptions received, he was very pleased to report a record result had been achieved. The Institute had never received so much in money in any one year previously, the amount being well over £3,000. The result was, there was a surplus of income over expenditure, otherwise profit, which was also a record amount of £658 8s. 8d. This had been carried forward on to the balance sheet.

With regard to the Special Technical Account Fund, shown on the liability side as loans of £150, this was, on the other side of the account, split up into three separate items. This was merely a book-keeping transaction which did not affect the Institute as a body. It referred to the work being done under the sponsorship of a Technical Committee, and particularly by Mr. Gardom. Money was sent to the Institute for that particular special work, and was recorded in the books. At the moment of striking a balance there was £150 in hand, but it was not the Institute's property and at the end of the war the item would disappear.

It would be understood from the Report that of the surplus income over expenditure it was proposed to reserve the sum of £250 for a Special Charter. It was hoped to obtain a revision of the Charter at the end of the war period. When the accounts were published for the next year it would be found that the balance sheet would show that amount had been allocated to that particular reserve fund, while the income would be placed in the Accumulated Fund.

Mr. Russell formally moved the adoption of the Balance Sheet and Statement of Accounts as circulated in the Annual Report.

MR. C. W. BIGG seconded the motion, which was carried unanimously.

Report of Technical Committee

MR. J. W. GARDOM presented the Report of the Technical Committee for 1940-41, a copy of which had been circulated among the members.* In doing so he stated it was the shortest report the Institute had ever published, but he could assure everyone that more work than usual had been done. The Committee had been responsible for the installation of plant in foundries in order to facilitate the production of war materials, and to effect war production extensions. Certain of those foundries were now nearing completion, and one was actually in production at the present time. During the past few weeks, quite a number of problems had had to be solved in respect to starting up foundries, and in one case an appeal had been made to the B.C.I.R.A. for help which had been freely given

MR. V. C. FAULKNER, in seconding the adoption of the Report, said that much of the work of the Technical Committee at the present time was of a hush-hush character. He had some knowledge of what was going forward, and the work was now reaching to rather high proportions. He thought they might couple with the motion congratulations to the Technical Committee for the excellent work they had done for the Government during the past 18 months.

MR. D. SHARPE congratulated Mr. Gardom upon the enormous amount of work he had been able to do during the past year on behalf of the Technical Committee.

The Report was adopted unanimously.

* This Report is appended to the Annual Report of the Council, reproduced above.

Medal Awards

The PRESIDENT announced that the Council had awarded the Oliver Stubbs Gold Medal for the present year to Mr. J. J. Sheehan, A.R.C.Sc.I., A.I.C.

The fifth annual award of the E. J. Fox Gold Medal was made by the assessors to Mr. Percy Pritchard.

The award of the Meritorious Services Medal was made to Mr. H. W. Lockwood, of the London Branch.

Diploma Awards

The SECRETARY (Mr. T. Makemson) announced that Diplomas had been awarded to the following-named members of the Institute for Papers read before certain Branches: Mr. J. F. Webster, "Rope Pulleys," read before the Scottish Branch; Mr. A. E. McRae Smith, M.A., "Melting and Casting Problems in the Production of High Strength and Special Duty Alloy Iron Castings," read before the Lancashire Branch; Mr. J. M. Stones, "Some Notes on Bell Founding," read before the South African Branch.

ELECTION OF OFFICERS, 1941-42

President

The retiring President, MR. W. B. LAKE, announced that the Council had nominated as President for the next year of office Major Richard Miles. He had very much pleasure in proposing his election. Major Miles had been a member of the Institute for many years, and possessed great energy as well as a considerable gift of eloquence. He took a real interest in foundry work and in the Institute itself; so that he would make an excellent President for the forthcoming year.

DR. J. E. HURST, in seconding the motion, said that if he had not been requested to do so he would certainly have asked to be permitted the honour of doing so. He had had the honour of proposing Major Richard Miles as a Vice-President, and he did so with all the greater pleasure as that gentleman was an old colleague of his.

Major Miles was then elected President of the Institute for the forthcoming year.

MAJOR R. MILES said he felt very proud to succeed to the long line of distinguished foundrymen who have worn this regalia, and only wished he had a figure that would show it to better advantage. Perhaps the foundry trade did not lend itself to getting fat, though there were important exceptions among his energetic friends, even in this present company.

The programme of the meeting compelled this acknowledgment to be brief. It was quite impossible to be brief in recounting the good work that had been done by Mr. Lake, the retiring President, not only during his repeated terms of office, but for the many years during which he had been connected with our Institute.

He would, however, recall the outstanding success he achieved as President of the last International Convention in London. It was grievous to think that the members' dealings with a number of visitors to that Convention were now on a different footing; but friends and enemies alike must regard the genial President as having contributed to that happier international understanding that must, in time, arise.

It was his hope that Mr. Lake would have seen his way to retain the Presidency during the War, and it was only out of deference to his wishes that he was taking his turn. He could not replace him. Only with difficulty was it possible to emulate the good work he has done for the Institute.

He therefore proposed, and asked the members to accord to him, a very hearty vote of thanks for his able guidance of the affairs of the Institute during his terms of office, and to wish him and Mrs. Lake long life and every happiness.

In conclusion, Major Miles paid the following poetic tribute to the merits of the retiring President:—

A vote of thanks to Mr. Lake.
Let all the castings he may make,
From flaws and blemishes be free,
And all be good and sound as he.
No blowhole, draw, nor porous spot,
No sand inclusion, nor cold shot,
No tear, nor scab, nor shifted core,
No short run, run-out, and no more
Cross-joint, distortion, wrong dimension;
And in accordance with intention,
Every analysis and test;
And all inspection well suppressed.
In sum, best luck be always resident
With Daddy Lake, our loved Ex-President.

MR. D. HOWARD WOOD seconded the motion that a hearty vote of thanks be accorded to the retiring President for his services to the Institute during the past years. Two years ago, when Mr. Lake was elected President, he was undoubtedly one of the most popular members of the Institute. By his regular attendance at its meetings, by his conduct of the business of the meetings, and his genial and charming personality, he had further endeared himself to every member of the Institute. During the two years of his presidency, the interests of the Institute had been his main concern; business affairs and domestic affairs had been more or less put on one side.

The vote of thanks was carried unanimously by acclamation.

MR. LAKE, responding to the vote of thanks, wished to state how much he had enjoyed the two years he had been President. For many years he had been deeply interested in the solution of foundry problems, and there was no other medium in this country by which clear ideas upon such subjects could be obtained than among the members of the Institute of British Foundrymen. His time in office had been made exceedingly pleasant because of the unfailing kindness he had received from everybody from the day he was inducted into office.

He wished to thank all the members of the Institute for the way they had assisted him and borne with his, he would not say perhaps failures, but with his not doing quite so well as he might have done. He wished to thank the Council also for their great assistance and for the forbearance they had invariably shown towards him, and particularly he would like to thank the Executive Committee and the Past-Presidents for the ever-ready help and advice they had given him in most difficult times. His thanks were due also to his own Branch—the London Branch—for nominating him to the position, and for the unbounded assistance they had given him to make the International Congress a success.

Annual General Meeting of I.B.F.

Finally, though not least, he wished to thank the two secretaries and the treasurer for the help they had given him. He had enjoyed his term of office so much that, had his health permitted, he would have dearly liked to have carried on for another year.

Senior Vice-President

The PRESIDENT-ELECT (Major Miles) then proposed that Mr. D. H. Wood be elected Senior Vice-President for the forthcoming year.

MR. F. J. COOK seconded the nomination, which was carried unanimously.

Junior Vice-President

MR. LAKE announced that, in view of the unsettled state of affairs created through war conditions, the Council had decided that it would not be wise to nominate a Junior Vice-President.

Auditors

Messrs. J. & A. W. Sully & Company were unanimously reappointed auditors for the Institute.

New Members on Council

The SECRETARY (Mr. T. Makemson) announced that the result of the ballot taken was as follows:—Five members were elected for two years—Mr. V. Delport; Mr. Barrington Hooper, C.B.E.; Mr. E. Longden; Mr. P. A. Russell, B.Sc.; and Mr. D. Sharpe. One member was elected for one year to complete the remaining year of office of the late Mr. R. A. Miles—Mr. H. J. Roe.

PRESENTATION OF MEDALS

The E. J. Fox Gold Medal

MR. E. J. FOX, in presenting the Medal to Mr. Percy Pritchard, said that the recipient's pioneer work for the industry was known to all who were in any way interested in foundry operations. He regretted that for the time being the Gold Medal would have to be represented by one which was silver-gilt. The only thing which puzzled him was why, having fallen from the high estate of gold, the Council did not select a metal which was used in the foundry industry, such as one of the aluminium or magnesium alloys. There might even have been a transformation into the vulgar cast iron.

MR. PRITCHARD, in acknowledging the receipt of the medal and its accompanying certificate, said he would make no attempt to disguise the fact that when he received that morning a notification that the award was to be made it was one of the proudest moments of his life. It was now something over 30 years since he first entered the foundry industry. The foundry was his first love, and it was still his best love, in spite of the fact that attempts had been made to wean him from it. Like many others he had a great belief in the future prospects of the foundry industry, and he had done what he could in order to raise its status in the industrial world. Great progress had been made during the past 20 years, and the work of the Institute had in no small measure contributed to its success. Technical administration in foundry work was now regarded as being more essential than ever before.

In one sense he could be regarded as being somewhat of a mormon. His first wife, and still his favourite wife, was the cast iron foundry. Then he took unto himself the aluminium and later on the magnesium branches of founding. As knowing something of the technical and metallurgical developments which were taking place in the light alloys industry and the cast iron industry, perhaps he might be permitted to sound a word of warning on the competition which the latter industry might expect to meet from the light alloys. Light metals were going to prove to be formidable competitors of cast iron. In this connection he wished to pay a tribute to the work done by the British Cast Iron Research Association, which had been strong supporters of the Institute, along, of course, with the British Non-Ferrous Metal Research Association. It was deeply gratifying to learn that at long last the Cast Iron Research Association were likely to acquire headquarters and new laboratories worthy of such an organisation and of the cast iron industry.

Mr. Fox had wondered why the Medal could not have been made of cast iron; perhaps the answer was that it might have been too expensive.

The Oliver Stubbs Medal

MR. W. B. LAKE then presented the Oliver Stubbs Gold Medal to Mr. J. J. Sheehan, in recognition of the work he had done for the foundry industry during the past few years. In addition to many valuable Papers which Mr. Sheehan had presented to different Branches of the Institute, that gentleman had also been elected the Institute's representative on the International Committee on Iron Castings. Mr. Sheehan's work was acknowledged to be of outstanding merit, and to have been of great assistance both to the ferrous and non-ferrous foundries. Again, although the Medal was only ver-gilt owing to the unfavourable conditions prevailing, the Council were resolved, if it were at all possible, to substitute a gold one at the earliest opportunity.

MR. J. J. SHEEHAN appreciated Mr. Lake's remark that the presentation of the Medal was due to the fact that he was considered an expert in foundry defects. (Laughter.) He could assure all present that if this was correct it was certainly not through an inherent desire to make defects, but owing to a long experience in the foundry industry.

Meritorious Services Medal

MR. W. B. LAKE then presented Mr. H. W. Lockwood with the Meritorious Services Medal, awarded by the Council of the Institute in acknowledgment of the good work done by Mr. Lockwood as secretary of the London Branch.

MR. H. W. LOCKWOOD acknowledged the receipt of the Medal and expressed his thanks for the same.

Investiture of the President

MR. LAKE then invested Major R. Miles with the Chain of Office and Badge of the President of the Institute of British Foundrymen, and the newly-inducted President presided over the subsequent proceedings.

Past-President's Medal

The PRESIDENT then presented the Past-President's Medal to Mr. Lake, and expressed the hope that that gentleman would wear it at many future meetings of the Institute.

Senior Vice-President's Medal

The PRESIDENT then inducted Mr. Howard Wood as Senior Vice-President, and invested him with the Senior Vice-President's Medal. Mr. Howard Wood had been for many years one of the leading members of the Institute in the Midlands, and he had been President of the Birmingham Branch. He was a most thoughtful and helpful member of the Executive Committee, and as far as his professional duties were concerned he was the managing director of one of the leading foundry constructional firms in the country.

MR. HOWARD WOOD expressed his appreciation of the honour which had been paid to him, and remarked that honours carried responsibilities with them. He hoped to be able to discharge the duties of the office of Senior Vice-President to the entire satisfaction of the members of the Institute.

Vote of Thanks

The PRESIDENT then proposed that a cordial vote of thanks be given to the headquarters staff and to Branch officers for their services rendered to the Institute and at Branch meetings. In this vote of thanks he wished to include overseas Branches. The conditions under which the work of the Institute had been carried on were far from easy ones. Mr. T. Makemson was now a most important official of the Iron and Steel Control Department of the Ministry of Supply, but nevertheless he had been able to do considerable work for the Institute as well. In Mr. J. Bolton they had a very able acting secretary, who possessed considerable initiative and was not afraid of responsibility.

The vote of thanks was carried unanimously by acclamation.

MR. T. MAKEMSON, in responding to the vote of thanks on behalf of all concerned, paid tribute to the way in which the assistant secretary, Mr. J. Bolton, had carried on the work of the Institute.

The President then presented his inaugural address, which was printed in our last issue.

Upon the motion of MR. F. J. COOK, seconded by MR. H. WINTERTON, a hearty vote of thanks was accorded to the President for the address.

The PRESIDENT having suitably responded to the vote of thanks, the proceedings of the annual meeting concluded.

Institute Luncheon

Prior to the Annual General Meeting a luncheon was held, over which Mr. Lake presided. Well over 150 members and guests participated. Amongst those present were Major R. Miles (President-Elect), Mr. J. E. Fox, Mr. Fitzherbert Wright (Director of Iron Castings), Mr. Percy Pritchard, Mr. D. Howard Wood (Vice-President), Mr. Barrington Hooper, C.B.E. (managing director, FOUNDRY TRADE JOURNAL), Mr. C. W. Bigg (Past-President) and Mrs. Bigg, Mr. F. J. Cook (Past-President), Mr. J. G. Pearce (Director of the British Cast Iron Research Association), Mr. V. C. Faulkner (Past-President), Dr. J. E. Hurst (Past-President) and Mrs. Hurst, Mr. S. H. Russell (Past-President and treasurer), Mr. R. Stubbs (Past-President) and Mrs. Stubbs, Mr. H. Winterton (Past-President), Mr. P. H. Wilson (joint managing director of the Stanton Ironworks Company), Mr. G. E. France (President of the Foundry Equipment and Supplies Association) and Mrs. France, and Mr. T. Makemson (secretary and Deputy Director of Iron Castings).

There were two presentations made during the course of the luncheon proceedings. The first was by Mr. C. W. Bigg, on behalf of the Past-Presidents of the Institute, who presented a gift to Mrs. W. B. Lake. The gift—cut-glass tableware—was accepted on her behalf by Mr. W. B. Lake, the retiring President. Mrs. Lake was unable to attend the luncheon owing to ill-health.

The second presentation was made by Mr. W. Holland, President of the Lancashire Branch of the Institute, who, on behalf of the Branch Council and members, presented a silver tankard to Major R. Miles, President-Elect, in order to mark the commencement of his presidential year of office.

MAJOR MILES, acknowledging the gift, mentioned that he was born in the Duchy of Lancaster, and expressed the hope that he would be able to visit the Lancashire Branch during his term of office.

Etching Media

In an article in "Archiv für das Eisenhüttenwesen," R. PUSCH summarises from the literature details of the various etching media for iron and steel which have been introduced recently. The number of these media has increased considerably during the last few years owing to the increasing use of alloy steels and the desire to examine constituents which are not revealed by the ordinary media. Special notice is devoted to media for studying the structure of plain and alloy steels, including high-alloy austenitic steels, and carbide etching media.

British National Specifications For Cast Iron*

A Review

By J. G. PEARCE, M.Sc., F.Inst.P., M.I.E.E.

The establishment in 1928 of the first national specification for general grey-iron castings (B.S.S. 321/1928), with which the original Test-Bar Committee of the Institute was actively concerned, was a landmark in the history of cast-iron testing. Among the revolutionary features of this specification were:—

(1) The introduction of the tensile test for use in parallel with the transverse test, previously used almost exclusively.

(2) The adoption of cylindrical test-bars, rendering obsolete the rectangular and square bars previously used, accompanied by the option of machining the transverse bar.

(3) The acceptance of the principle of adjusting size of bar to section of casting represented by it.

(4) The adoption of test-bars cast separately from the casting.

In addition, the specification both actively and passively, that is, both by what it said and by what it did not say, powerfully reinforced the principle that for general purposes, iron castings should be specified by their mechanical properties and that composition should be left to the discretion of the founder.

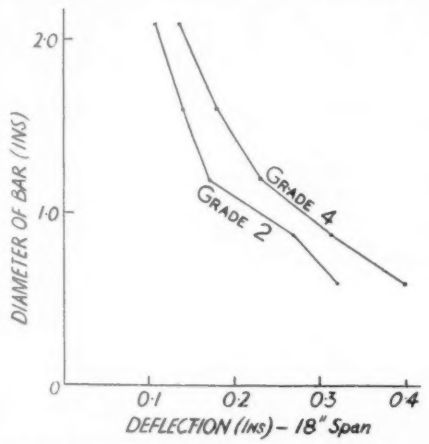

FIG. 1.—DEFLECTION AND DIAMETER OF BAR.

Experience has confirmed the accuracy of the original basis, which has been extended, and in minor degrees modified. To-day there are six grades of iron covered in two specifications, 321 and 786, ranging from 9 to 26 tons per sq. in. in tension, and five test-bar sizes in place of the original three. As was hoped, the basis of testing has been adopted both in new and in revisions of earlier B.S. Specifications. It has had repercussions abroad. A great deal of experience has now been recorded on the round bar, to be found in British, U.S. and Continental sources. The war has given an enormous impetus to the use of these specifications, both for new products and for cast-iron replacements of other materials. Their existence has been a great advantage to the industry.

In some quarters, a demand for revision has been expressed, to take care of the minor inconsistencies arising from the growth of the specification on a basis of experience and the inevitable compromises of committee working. Attention has been drawn, for example, to the gap between the highest grade in 321 and the lowest in 786; to the fact that the transverse strengths do not entirely line up with the tensile strengths, and to the fact that the lowest grade of 786 is not normally accepted as high-duty iron. Such a revision must wait on events, but it may be of interest to foreshadow some directions in which improvement may be made and to furnish a basis for discussion, although pressure of other work under present conditions has prevented this being made as complete as was intended.

The Transverse Test

Skin-machining transverse bars gives a rather better result, and, what is perhaps more important, more consistent results from a series of bars[1,2]. This may be due to the removal of the stressed skin, especially from greensand moulds. The effect is less pronounced in bars from dry-sand or core-sand moulds. If more than about 0.10 in. on the diameter is removed, the strength may begin to fall.

The conversion of transverse breaking loads to rupture stress, for reasons previously given,[3] is now widely followed. The specifications provide for the conversion of breaking loads obtained on an actual bar, not cast quite to size, to those expected from the corresponding standard bar. The conversion of breaking loads on one standard bar to what might be expected on another standard bar differing in diameter leads, however, to erroneous results, because transverse stress changes with size.

Deflection

The deflection figure gives a valuable indication of toughness, but its value is obscured by diameter and span variations in test-bars and by changes consequent on the change in quality between various grades. At present, deflection is regarded principally as an indication of regularity in manufacture, rather than as of intrinsic value, although it has such a value. If the test-bar be considered as a beam under load, the deflection is directly proportional to the square of the span; if the span is doubled, the deflection is quadrupled. As the diameter of bar increases, the deflection diminishes for a constant span, and in practice the deflection can be taken as inversely proportional to the diameter of the bar, the product of diameter and deflection being approximately constant. Bars can therefore be readily compared with respect to deflection, even if spans and testing diameters differ. To illustrate this point, the deflections are given in Table I for the various sizes of bar in Grade 2 and in the new Grade 4 of B.S.S. 786. The deflection figures are then given for a uniform span of 18 in. on all sizes, and Fig. 1 shows how the diameter changes with deflection for a constant span. Such curves can be constructed for all grades and facilitate the fixing of consistent deflection figures. Table I also gives the product of deflection and diameter. The slight inconsistency in the Grade 2 figures is at once evident from Fig. 1, the deflection being slightly low on the 1.2 in. bar and slightly high on the 0.875 in. bar.

The statements above relating to the test-bar as a beam are strictly true only if the bar is an ideal beam, which is not the case. Consider loading a transverse bar to a point short of fracture. On removal of the load, the bar appears to return to its original position. If it returned fully, the bar would be wholly elastic and these statements would then apply. It is found, however, that, on removal of the load, there is a small permanent deflection or set. This can be used to estimate the proportion of permanent deflection or set in the total deflection at fracture.[3] The remainder, or part which disappears on removal of the load, is elastic deflection and in ordinary engineering irons about 75 per cent. of the total deflection is elastic and the remainder is permanent set. These two components enable one to distinguish between brittle and tough irons, for rigid or brittle irons have a low permanent set, and tough irons a high permanent set, as do irons having a high resistance to shock. In an open-grained iron, the proportion of elastic to total deflection may fall to 60 per cent. and in a very rigid iron rise to 90 per cent.

The total deflection increases at a greater rate than the load. The elastic deflection increases at the same rate as the load, or at only a very slightly greater rate. Bars capable of withstanding higher loads prior to fracture, the tough irons, therefore have a higher proportion of permanent set in the total deflection.

In considering these components in relation to size of bar, the permanent set varies little from thick to thin bars, and therefore the curve showing changes in elastic deflection with diameter is approximately parallel with those shown, for example, in Fig. 1. In making use of beam formulæ for calculating stresses, elastic moduli, etc., the total deflection is more accurately replaced by elastic deflection. So far as design is concerned, however, at ordinary working loads there is only a very small difference between elastic deflection and total deflection, as the permanent set is, under these conditions, very low, and hence the error in taking total for elastic deflection is small. At fracture, the difference is considerable, and hence elastic moduli calculated from total deflection show large errors.

TABLE I.—*Correlation of Deflection Results on Bars of Increasing Diameter and Span for B.S.S. 786, Grades 2 and 4*

Diam. In.	Span. In.	Deflection. In.		Deflection on 18-in. span. In.		Deflection by diameter.	
		Grade 2.	Grade 4.	Grade 2.	Grade 4.	Grade 2.	Grade 4.
0.6	9	0.08	0.10	0.32	0.40	0.19	0.24
0.875	12	0.12	0.14	0.27	0.32	0.24	0.28
1.2	18	0.17	0.23	0.17	0.23	0.20	0.28
1.6	18	0.14	0.18	0.14	0.18	0.22	0.29
2.1	24	0.19	0.24	0.11	0.13	0.23	0.27

The difference between an ordinary engineering iron and a high duty iron under transverse loading is shown in Fig. 2. Increasing loads are measured along OQ, and the resulting increase in deflection is shown along OP. The engineering iron breaks at A under a load OR and with a deflection RA. The high duty iron breaks at B under a load OQ with a deflection QB. It will be observed that at the load R, the high duty iron has a deflection RC, considerably lower than that of the ordinary iron, RA. This is generally true of all close-textured, dense irons as compared with open or coarse-fractured irons. The difference lies almost wholly in the permanent set, and the latter show high permanent set, but early rupture.

The resistance to fracture of high duty iron

* Presented at the 38th Annual Conference of the Institute of British Foundrymen, held at Manchester on July 19.

British National Specifications for Cast Iron

results in it breaking not only at a higher load, but also with a higher total deflection. The high duty iron has a lower deflection per unit of load, but a greater total deflection. The superior properties of the high duty iron have arisen from reducing the permanent set and thereby enabling greater elastic deflection to take place under load. The total deflection in ordinary comparisons may not appear to be greatly changed, but its character is, in fact, materially altered.

The significant change is the slope of the deflection line, that of the high duty iron, represented by the tangent OM, being much more nearly vertical than that of the ordinary iron, represented by the tangent ON. Such a tangent drawn from the point O very closely approximates to the line showing elastic deflection, and the area of the rectangle so cut off gives a figure of merit for an iron with respect to this test, the product of load and elastic deflection. In Fig. 2 the high duty iron is represented by

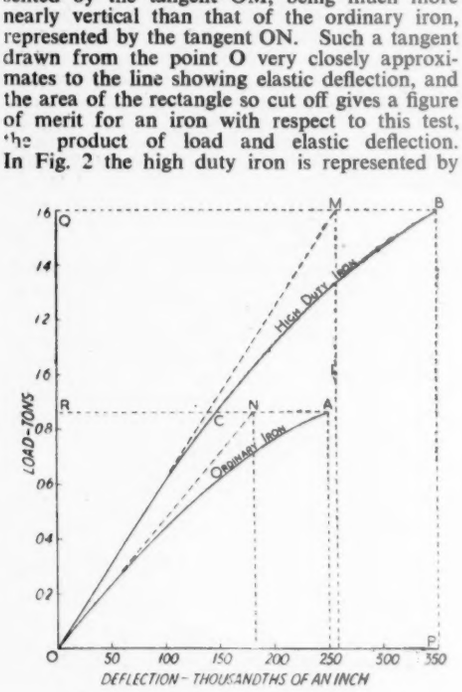

FIG. 2.—LOAD-DEFLECTION CURVE.

the product OQ × QM and the ordinary iron by the product of OR × RN. The figure of merit clearly increases with the quality of the iron.

Transverse-Tensile Relationship

The fact that a beam breaking in transverse shows a higher specific stress than the same material broken in tension, constitutes the beam paradox, for in a material so much stronger in compression than in tension, transverse failure, due to a combination of tensile and compressive stresses, must fundamentally be a tensile failure. There is a reasonably regular relation between tensile and transverse stresses. If the transverse rupture stress is designated R, and the ultimate tensile stress T, both in tons per sq. in., the ratio $\frac{R}{T}$ is not constant. As evidence has been collected, the relation has become more accurately known. It varies between 1.5 to 2.2, being usually 1.8 to 2.0. The author later found that the expression $R = T + 11$ was more satisfactory, and this was used in B.S.S. 786, where the two strengths differ by 11 tons per sq. in. These were evidently only first approximations, for in any equation connecting R and T, when one is zero, the other must also be zero.

The development in recent years of high-duty irons has enabled a much wider range of strengths to be charted from a large number of cases. From the transverse and tensile strengths so obtained, the curve shown in Fig. 3 results, and it will be seen that in the middle range it is substantially straight and slightly curved at the upper and lower ends. This curve enables the transverse strengths to be more accurately estimated with respect to corresponding tensile strengths. The full line covers the range of strengths for which evidence is available. Figures for the tensile strengths given in the two specifications are accompanied by the transverse values deduced from this curve in Table II.

It will be seen that the differences are small, but inconsistencies are removed. A series of values which form a continuous range for the 1.2-in. bar of tensiles at intervals of 2 tons, is given in Table III. The odd series includes four already appearing in 321 and 786, and the even series only two, marked with an asterisk. The corresponding deflections can also be accurately estimated, as indicated above. In this way, a regular range of irons could be specified, covering all reasonable requirements, giving eight materials in place of the present six. The effect is to fill the gap between Grade A and Grade 1, retaining Grades A and C. Grades 1 to 4 are virtually retained, with a grade between

TABLE II.—*Transverse Values for Specified Tensile Values.*

Tensile. Tons per sq. in. From 321 and 786.	Corresponding Transverse. Tons per sq. in. From Fig. 3.	Transverse from B.S. Specifications.
9.0	19.6	17.7, 18.3, 18.9
10.0	20.7	19.6, 19.9
10.5	21.2	21.4
11.0	21.8	23.1
12.0	22.9	24.1
12.5	23.4	25.1, 23.6
13.0	24.0	24
14.0	25.1	25
15.0	26.2	25.9, 26.1
16.0	27.3	27
17.0	28.4	28
18.0	29.5	28.9, 29.1
19.0	30.6	30
20.0	31.7	31
21.0	32.8	33
22.0	34.0	33, 35
23.0	35.3	34, 37
25.0	38.3	39
26.0	40.0	41

3 and 4 to make a consistent series. Such a series would enable the present mixed nomenclature of letters and figures to be improved.

The straight portion of the curve, Fig. 3, has an equation of approximately $R = 1.1T + 9.5$, or the transverse rupture stress is 1.1 times the ultimate tensile stress plus 9.5 tons. The curved portions would have equations of such a kind that it is simpler to determine R appropriate to a particular value of T or *vice versa* direct from the curve.

The equation could be altered to give a very different appearance without substantially altering the results. From a much more limited range of values, the author gave in 1930 the equation $T = 0.59R - 4{,}000$, the stresses here being in lbs. per sq. in.,[4] and the resulting R from a given T is not widely different in the two cases.

TABLE III.—*Proposed Series.*

Odd.		Even.	
Tensile. Tons per sq. in.	Transverse. Tons per sq. in. Fig. 3.	Tensile. Tons per sq. in.	Transverse. Tons per sq. in. Fig. 3.
9*	19.6	10	20.7
11*	21.8	12	22.9
13	24.0	14*	25.1
15	26.2	16	27.3
17*	28.4	18	29.5
19	30.6	20*	31.7
21	32.8	22	34.0
23*	35.3	24	36.8

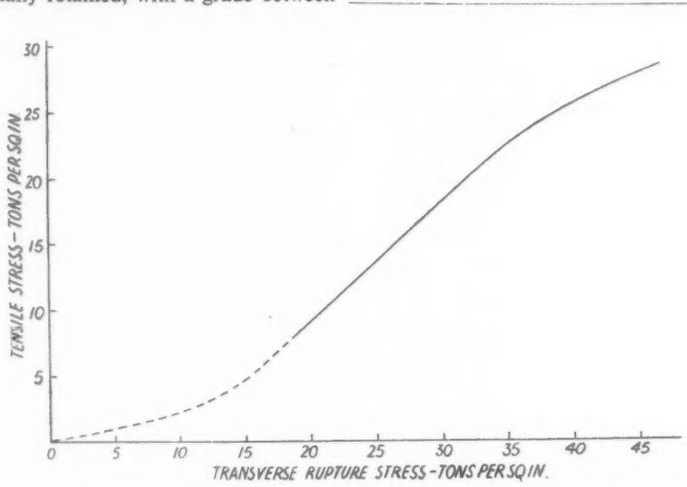

FIG. 3.—RELATIONSHIP BETWEEN THE TENSILE AND TRANSVERSE STRENGTHS OF CAST IRON

One very interesting result follows from the curve, Fig. 3. It has been supposed hitherto that as irons improve, the transverse value does not increase as rapidly as the tensile, and conversely that in the weaker irons the tensile is lowered relatively more than the transverse. Fig. 3 shows through the bending of the high duty iron end to the horizontal axis, that R increases relatively more than T. At the other end, the bend in the reverse direction shows that the view with regard to weaker irons was correct.

The author is confident that, while for various reasons freak results may be recorded, as a general rule any combination of tensile and transverse figures obtained from properly tested, sound bars will not lie far off the line in Fig. 3.

Influence of Size of Bar

It is well known that in all cast metals a thick section is weaker per square unit of area than a thin section of the same metal. One of the great advantages of high duty irons is that they show this change with section much less than commoner irons, and, of course, by appropriate adjustments to composition, the difference in strength between larger and smaller castings is minimised. Even so, however, the founder is not expected to obtain the same strength in a thick as in a thin bar. It may be asked whether there is any logic in providing that the strength of a large casting in, say, Grade 2 iron should

(*Continued on page* 64.)

American Synthetic Sand Practice*

By NORMAN J. DUNBECK†

[AMERICAN FOUNDRYMEN'S ASSOCIATION EXCHANGE PAPER]

(*Continued from page* 41.)

Choice of Clay

From the results in various tables, a choice of certain clays for certain work can be made.

Non-ferrous

(1) Light:—Southern bentonite for its combination of high permeability and high flowability.

(2) Heavy:—Fire clay for economy, if the permeability be not too important or to smooth up sand if only coarse sands be available. Western bentonite for highest permeability combined with high hot-strength. Fire clay:—Southern bentonite for high hot-strength and economy if slightly lower permeability be acceptable.

Grey Iron

(3) Light:—Southern bentonite for its combination of high permeability and high flowability.

(4) Medium:—Fire clay for economy if permeability be not too important or to smooth up sand if only coarse sands are available. Western bentonite for highest permeability combined with high hot-strength. Fire clay:—Southern bentonite for high hot-strength and economy if slightly lower permeability be acceptable.

(5) Heavy:—Fire clay for high hot-strength and economy, particularly on dry sand work where permeability is not important. Western bentonite for highest permeability combined with high hot strength. Fire clay:—Western bentonite for highest hot-strength.

Malleable

(6) Light:—Southern bentonite for its combination of high permeability, high flowability and moderate hot-strength.

(7) Medium:—Fire clay for economy. Southern bentonite for highest permeability and flowability combined with moderate hot-strength to prevent cracked castings. Fire clay:—Southern bentonite for moderate permeability and moderate hot-strength. Western bentonite:—Southern bentonite for highest permeability, combined with moderate hot-strength.

(8) Heavy:—Fire clay for high hot-strength and economy, particularly on dry sand work where permeability is not important. Western bentonite for highest permeability, combined with high hot-strength. Fire clay:—Western bentonite for highest hot-strength.

Steel

(9) Light:—Southern bentonite plus cereal binder for its combination of high permeability and high flowability.

(10) Medium:—Southern bentonite-Western bentonite plus cereal binder for high permeability, high dry-strength and moderate hot-strength.

(11) Heavy:—Fire clay plus cereal binder for high dry-strength, high hot-strength, and high sintering point. Western bentonite plus cereal binder for high dry-strength, high hot-strength, and highest permeability. Fire clay:—Western bentonite plus cereal binder for high dry-strength and highest hot-strength.

* Presented at the 38th Annual Conference of the Institute of British Foundrymen, held at Manchester on July 12.

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METHODS OF APPLICATION

In Sand Heaps

Several methods may be used to add bonding clays to foundry sand. A small amount of clay bond may be placed on each mould before it is shaken out. With most bonds, this is satisfactory on heaps where a sand-cutter is used for sand preparation only if the cutting and mixing is done most thoroughly. It also may be spread over a heap and cut in, but full efficiency is not obtained from the bonding material in such usage, and there is danger of clay balls forming. When this method is used, the clay and heap sand should be cut thoroughly dry before tempering water is added.

Some foundries mix the clay bond with water to form a slurry, and use this mixture as their tempering water. This gives high efficiency from the amount of clay so used, but it is not possible to introduce enough clay for very high strengths by this method because of the relatively small amount of tempering water usually required. The method is economical since it eliminates transportation and mixing costs as compared to machine mixing. The strength delivered depends not only upon the strength of the clay used, but also upon the quality which it is possible to carry in slurry form. This, in turn, depends upon the maximum viscosity of slurry which can be pumped. Such point of maximum viscosity for average conditions is given in Table VII.

Because Western bentonite immediately swells to a gel, only a relatively small amount can be incorporated in a slurry of pumpable viscosity. Southern bentonite, being non-swelling, readily slakes in water in the same manner as does fire clay. The figures for "relative effective strength" are arrived at by using Western bentonite as a base at 100 per cent., and computing other strengths from known relative values and amounts present in slurry.

TABLE V.—*Hot Strength of Combinations of Bond Clays.*
Base sand, unbonded silica. Average grain fineness, 53.

Bond or combination.	W.B.	75 per cent. W.B.* 25 per cent. O.F.C.†	50 per cent. W.B. 50 per cent. O.F.C.	25 per cent. W.B. 75 per cent. O.F.C.	O.F.C.
Per cent. bond	5	5.2	6.8	8.5	10
Per cent. moisture	2.5	2.3	2.8	3.5	3.3
Permeability	167	162	154	116	103
Green compression	9.6	9.1	8.7	8.8	8.7
Green deformation	0.012	0.013	0.017	0.018	0.015
Dry compression	83.0	75.0	125.0	120.0	47.5
Hot strength :—					
260 deg. C.	75	40	65	116	38
535 „	74	65	100	160	60
815 „	195	120	240	250	80
1,040 „	490	560	830	1,000+	295
1,370 „	8	5	6	8	5
Strength after cooling from 425 deg. C.	55	61	89	110	—

* W.B. = Western bentonite. † O.F.C. = Ohio fireclay.

TABLE VI.—*Hot Strength of Auxiliary Binders.*
Base sand, unbonded silica. Average grain fineness, 53.

Bond or combination.	S.B.*	4 per cent. S.B.* 1 per cent. C.F.†	5 per cent. W.B.‡	5 per cent. 1 per cent. W.B. C.F.	4 per cent. S.B. 3 per cent. pitch.	4 per cent. S.B. 1 per cent. rosin.
Per cent. bond	4	—	5	—	—	—
Moisture	2.6	3.6	2.5	3.5	3.5	3.5
Permeability	178	138	167	152	110	128
Green compression	9.9	8.2	9.6	9.3	11.7	8.1
Green deformation	0.008	0.034	0.012	0.027	0.013	0.012
Dry compression	47.0	133.0	83.0	87.0	158.0	145.0
Hot strength :—						
260 deg. C.	21	85	75	63	67	42
535 „	35	48	74	50	144	45
815 „	30	45	195	105	102	41
1,040 „	25	65	490	280	100	96
1,370 „	3	3	8	6	6	3

* S.B. = Southern bentonite. † C.F. = Cornflour. ‡ W.B. = Western bentonite.

Fire clay and illite must be used in considerable quantity when mixed by sand cutter instead of muller, and there is a tendency for clay balls to form. Western bentonite mixes reluctantly because of its swelling nature on contact with water. Non-swelling Southern bentonite quickly slakes into a slurry on contact with water, and is a safe material for this type of application. This has some importance in that it makes the advantages of synthetic sand available to foundries that have not felt they could use bond clay because they do not have intensive mixers.

In Mixing Mills

The best method of rebonding a heap of sand, where a muller mixer is available, is to manu-

TABLE VII.—*Clay Content and Relative Strengths in Slurries.*

	Per cent. clay in slurry.	Percentage relative effective strength.
Western bentonite	8.25	100
Southern bentonite	34.20	491
Ohio fire clay ..	52.30	288

American Synthetic Sand Practice

facture a synthetic sand. This may be a mixture, in any proportions, of used moulding sand, burned core sand or new silica sand, with the proper amount of clay bond. Such a sand may be made with high or low permeability and with high or low strength, thus giving a very flexible control of sand conditions. Such a sand often is made by a night shift on the mixer, so as not to interfere with the daytime production of core sand or facing sand. When the proper sand has been prepared, it is added to heaps or systems exactly as is natural moulding sand, thus avoiding any change in sand handling methods.

When there is sufficient or excess volume of sand in the system or heap, a concentrated mixture of sand and clay bond may be made. This may vary from 20 to 40 per cent. bond. Such mixtures must be mixed very dry, usually with 2 per cent. of water or less. These mixtures reduce handling costs and aid in controlling the volume of the sand. Less efficiency is given by the amount of clay in such concentrated mixtures than is given when smaller amounts of clay are mulled thoroughly at their proper moisture content.

The statement is still sometimes made that the use of clay bond results in loading up a heap with clay with reduced permeability. This might be true if clay were added continuously to the same mass of sand. Actually, the sand is constantly changing. Each day a portion of it is carried away on the castings and an equal volume of prepared sand is added. A cycle is thus established where permeability is maintained at any desired point by varying the composition of the added sand.

Synthetic sand is so flexible that it makes sand control easier. The purpose of sand control is to permit prediction of results to be obtained through proper selection and testing of materials. If bad castings result, the fault is with the sand control and not with the sand, whether naturally-bonded or synthetic.

In Sand Handling Systems

It is a simple matter to add clay bond to any sand handling system if the system has any type of sand mixer. Any type of clay will work successfully, because the clay is added in small regular additions. The clay may be placed on top of each mould before it reaches the shake-out; it may be added manually or by any type of feeder at the shake-out; it may be fed to the mixers as a slurry; or it may be fed into the system in any convenient manner as a prepared synthetic sand of any desired strength.

Burned core sand which is shaken out into the system sand usually aids in maintaining necessary volume of sand. If additional silica sand be required either for volume or permeability, it may be added in any convenient manner.

In Facing Sands

Bonding clays are of particular value in preparing facing sands, since they permit great flexibility in the control of strength without the notable variations in permeability which would accompany similar changes in strength, if effected by additions of naturally-bonded sands. The usual facing mixture consists of used moulding sand, plus some casting cleaning element (such as coal dust for iron castings), plus clay bond, plus enough silica sand to give the required permeability. Burned core sand from oil-sand cores may replace the silica sand if its grain size be such as to ensure the necessary permeability. Since such silica or core sand is the only new sand material entering the foundry, it eventually will dominate the heap or system sand which comes back to the mixer to be made into facing or synthetic sand. As the permeability of this returned sand rises, the amount of burned core sand or new silica sand being added to the facing mixture is decreased. In foundries where it is essential to produce a very fine finish, a fine silica sand is used. In any case, the objective is to secure a sand of maximum fineness which will give the permeability required through its uniformity.

When a durable clay is used in the facing, it loses only a moderate amount of strength on pouring, and the remaining strength, upon mixture of facing and backing sand, is frequently sufficient to maintain the strength of the backing sand without further clay additions.

In many American iron foundries, some casting cleaning element, such as coal dust, is added to all the system sand as mixed, thus, in effect, making all the sand in the system into facing sand. This eliminates the cost of the separate mixing, storage and transportation of facing sand. No difficulty is experienced in the preparation and use of such sand except for the fact that the sand may become quite hot when reused several times per day. In such cases it is essential to use a bond clay which does not become sticky when hot.

Sand Reclamation

Many foundries have now installed sand-preparing and reclaiming units. Such units may have a floor-level grating into which is dumped excess or used moulding sand, burned core sand, gangway sweepings and, in general, any sand that can be collected around the foundry. A magnetic separator removes metal, a coarse screen removes hard core, wedges, etc., and a suction fan removes dust and fines. Vibrating screens may be installed to classify the sand. The amount of suction applied to the system is adjustable, and a greater or lesser amount of fines is removed, depending upon permeability and finish requirements.

This cleaned sand usually is stored in a bin directly over the mixer, into which it is fed as required for the production of facing sand or synthetic sand to be added to systems or heaps. Where a reclaiming unit is in use, permeability usually may be controlled by the amount of fines removed, with no additions of new silica sand.

General

In any application of clay bond, it is important to mix the bond and sand dry before adding tempering water. This results in much higher efficiency from the clay, and eliminates the possibility of clay balls being formed by the addition of water to the bond before it has been distributed through the sand.

There is also a growing tendency to keep some bonding clay available in all foundries even though naturally-bonded sand is the principal material used. The bond is used to bolster up weak natural sands; to add strength to facing sands, and to build up heaps which ordinarily require excessive additions of new sand. Such a heap would be one in which large quantities of burned core sand fell into the heap upon shaking out castings or where very heavy castings burned the sand badly on each pouring. The addition of the necessary amount of new sand to restore strength would result in a large surplus, and the daily discarding of enough old sand to make room for the new material. In such cases, clay bond is used in place of new sand, or in addition to the use of a reduced quantity of new sand.

Testing and Control

A.F.A. Reprint 36-26[2] covers very thoroughly American practice in the testing and control of synthetic as well as natural sands. The methods used are covered in the volume "Testing and Grading Foundry Sands and Clays." Both publications are available through the A.F.A., and probably are available in many United Kingdom libraries. A few additional comments on testing seem desirable.

Clays

In testing comparative value of clays the following conditions are necessary for accurate results:—

(1) All materials must be carefully measured or weighed.

(*a*) The difference caused by careless measuring of several scoops of clay may be greater than the actual difference in strength of materials being compared.

(*b*) Different clays vary considerably in weight per unit.

(2) All materials must be entirely dry.

(*a*) A difference of ½ per cent. in water content in a damp silica sand cannot be detected by observation but may account for as much as 18 per cent. difference in results.

(*b*) A difference of a few per cent. in natural moisture content of a clay may cause up to 30 per cent. difference in strength. A fire clay may appear perfectly dry when containing 4 per cent. water and a bentonite may appear dry when containing 10 per cent. water.

(*c*) The moisture content of clay affects strength not only through its replacement of equal quantity of bonding material, but most importantly by its reduction of rate of distribution of the clay.

(3) Clays of the same type should be tested at exactly the same moisture content in the sand. The stronger sand will feel drier and may be too dry for moulding. Proper procedure is then to keep moisture the same and reduce amount of clay. Common and incorrect procedure is to add water until both batches have the same feel. Since synthetic mixes get weaker as they get wetter, such water addition destroys the difference in strength which it was intended to measure.

(4) Test specimens should be tested individually as produced to avoid the effect of rapid surface drying.

(5) Since variables are unavoidable in large-scale foundry tests, final report should average results from at least three batches or mixes.

(6) A standard should be run with each test because of the effect of atmospheric conditions. This important precaution is rather universally disregarded.

Sands

One important fact, which is not given sufficient consideration in the interpretation of test results, is the relation between various tests. There is too much of a tendency to consider each test by itself. To illustrate this, it is proposed to consider only one property: permeability, and the effect upon it of other factors. Some of these factors are:—

(1) *Water Content.*—Two foundries each reporting a permeability of 90 might be considered to be operating under similar conditions. Further investigation may show that one is using synthetic sand with 3.5 per cent. water and the other naturally-bonded sand with 7.0 per cent. water, when it is immediately realised that there is a difference in practical results. The venting efficiency of a sand obviously depends upon its permeability, which is a measure of its ability to promote gas escape, and its moisture content, which is the major portion of the gas to be evacuated. This simple fact is frequently overlooked.

(2) *Clay content* affects permeability in two ways, since in increasing amounts it reduces permeability not only because of the amount present, but also because of the increased amount of tempering water required. Some types of clays yield much higher permeability than others, even when present in equal quantity and although the strength of one may be far higher than the strength of the second.

(3) *Grain size and shape* affect permeability in three ways:—(*a*) Percentage of voids in

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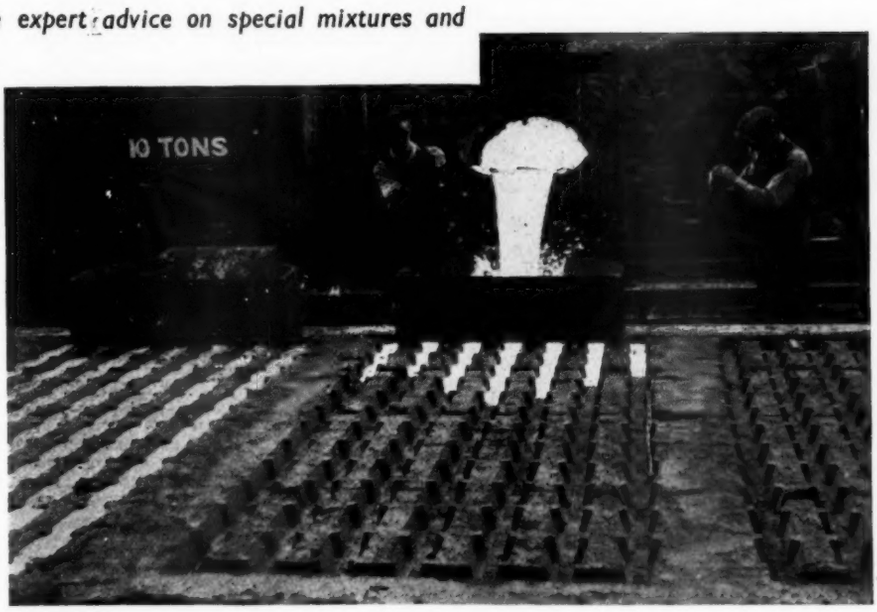

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

American Synthetic Sand Practice

sand, (*b*) percentage tempering water required, and (*c*) percentage bond clay required.

(4) Amount of ramming or mould hardness affects permeability, since a hard-rammed mould will have lower permeability than one which is lightly rammed. The laboratory test specimen gives relative values, but foundrymen must think of permeability in terms of actual mould conditions. Dietert gives the following formula for determining mould permeability:

$$\text{Mould permeability} = \frac{H \times P}{h}$$

where: H = Laboratory specimen (average hardness); P = laboratory permeability (A.F.A.); h = mould hardness of mould.

(5) The sectional thickness of sand in the mould affects permeability in the same manner as hard ramming. The thicker the section, the higher the permeability which is required, and the less informative the relation between laboratory permeability and mould permeability. Dietert gives the following formula for determining the reduction in permeability with increased thickness of sand:

$$\text{Venting permeability} = \frac{25\sqrt{P}}{D}$$

where: P = permeability; D = depth of sand over pattern in inches.

Disadvantages of Naturally-Bonded Sands

Naturally-bonded sands conforming to the description of a more or less ideal sand are not available in all localities, and the carriage involved in transporting good sands may make them quite costly. In addition, the following objections are raised against some naturally-bonded sands:—

(1) It is costly to use a sand only until its strength is burned out and then discard all the sand, although the grain itself is still good and it lacks only bonding strength.

(2) Any naturally-occurring product is subject to considerable variation even when tested and controlled.

(3) Most naturally-bonded sands have a rather complex grain structure which is not uniform in distribution.

(4) Most naturally-bonded sands have a rather complex mineral composition, and contain impurities from the materials from which derived. On heating, the easily fusible minerals, becoming liquid, attack the more refractory minerals and the melting point of the aggregate is lowered. Naturally-bonded sands seldom approach synthetic sand in refractory value; sintering point or durability.

(5) All naturally-bonded moulding sands and particularly the finer sands have a high percentage of silt in the portion known as "A.F.A. Clay." This silt reduces permeability and requires a high percentage of tempering water to make the sand reach proper working conditions and "feel."

(6) Naturally-bonded sands are sometimes not available during the winter months, and arrive in bad condition when available. It is costly to store a winter supply of sand and, unless kept in heated bins, the sand frequently freezes, causing extra expense in preparation for use.

Disadvantages of Synthetic Sands

(1) Synthetic sands are workable over a narrower moisture range than natural sands.

(2) Synthetic sands dry out more rapidly than natural sands.

(3) Most synthetic sands require more extensive mechanical equipment than is essential for natural sands.

(4) There is more difficulty in finishing and patching synthetic sands than is the case with natural sands.

Advantages of Synthetic Sands

(1) They make possible substantial savings. The cost of hauling used sand to a mixer is no greater than the cost of hauling it to the dump. The cost of transporting rebonded sand to the point of use is no greater than the cost of taking in an equal quantity of new naturally-bonded sand. The handling costs cancel out, therefore, and the charges against synthetic sand are the cost of the bond clay, the cost of any silica sand additions, and the cost of mixing.

(2) Synthetic sands have much greater durability or life than naturally-bonded sands, and one ton of synthetic sand may maintain strength for 50 to 200 per cent. longer than a ton of naturally-bonded sand.

(3) Silica sands are much more uniform than naturally-bonded sands, and bonding clays are dependably uniform. Since the foundryman is making a definite mix to satisfy his own conditions from uniform materials, the result is a much better control over sand conditions.

(4) The base sand will be free of silt, and the bonding clay will be very low in silt. The fine material in the sand will be almost all active bonding clay. This results in higher permeability, better flowability, and considerably less tempering water required.

(5) Synthetic sands are almost always more refractory, and give higher sintering points than naturally-bonded sands. This results in better stripping and lower cleaning costs.

(6) Being made from simple materials, synthetic sand is easy to control, and American practice shows a sharp reduction in scrap losses with a change to synthetic sand.

(7) Synthetic sand, being made as required, eliminates the investment in carrying a winter supply of natural sand in storage, and eliminates the difficulties due to such sand freezing in unheated bins.

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[2] W. G. Reichert, "Present Status of Foundry Sand Investigation and Control." A.F.A. Reprint 36-26.

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(*Concluded from page* 60.)

be slightly lower than that of a smaller casting in the same iron. It may be argued that if a consumer wants 18 tons per sq. in., he wants it irrespective of section, and that there would be no difficulty in supplying him with the same strength in a heavy section, even if the maker were driven to use a different mixture. This, indeed, is the solution adopted by our American friends, who, incidentally, have adopted British practice of varying test-bar size with section of casting, although they were many years ahead in the use of the round bar and of the tensile test. The quality of the various grades of cast irons specified in the U.S.A. is independent of section, although test-bar and casting are related.

Advantage of British Practice

There is, however, advantage to be gained by following British practice. First of all, it assists the buyer to realise that he cannot expect quite the same properties in a large section as in a smaller section, and in extreme cases he is prevented from asking for heavy castings in strengths appropriate to lighter castings. Secondly, it is the usual practice for a firm to concentrate on the production of a few types of material, and the average founder finds it inconvenient to change his practice and mixtures with each order. There is considerable practical convenience in a recognition of the fact that a foundry making a range of sizes in, for example, Grade 2 iron, will not obtain quite the same strength in the heavier castings.

Taking the present standard bar sizes, it will also be found that the tensile-transverse points in Fig. 3 for the range of diameters will also lie very closely on the curve, and thus a series of values not only for each grade of iron, but also for each size of bar can be evolved, consistent in themselves and to the whole. In practice there will be about 1 ton per sq. in. in tensile difference in strength between each bar and the one next to it in the series. Thus a complete range of strengths and deflections can readily be built up.

Incidentally, in a series of five test bars, the diameters of four of which are expressed in tenths, the diameter of the 0.875 in. bar is unlikely to remain in eighths.

Separately-Cast Test-Bars

Little difficulty has arisen from the use of separately-cast test-bars, the metallurgical desirability of which, compared with the cast-on bar, is now accepted. It is noteworthy that one important authority some years ago expressed its willingness, in case of dispute, to accept the identity of test-bar and casting by an analysis for either silicon or phosphorus. The sensitivity of the analytical method is greater than the difference between the test-bar and casting, unless they were poured from the same metal at the same time. Standard methods of analysis should, of course, be used.[5] As far as the writer is aware, no case has arisen needing to be settled in this way, and the old argument that if the inspector is not present, the bar must be cast-on to ensure identity of bar and casting has lost its force.

The author thanks the Council of the British Cast Iron Research Association for permission to publish this Paper.

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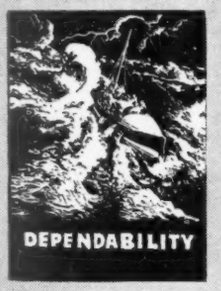
A Fire Bomb Detector

An equipment employing a light-sensitive selenium cell for detecting and locating incendiary bombs has been devised by Mortimer, Gall & Company, Limited, 115/117, Cannon Street, London, E.C.4. The detector units are placed either inside or outside a building—or both—depending on the structure of the roof and the principle upon which the fire-watchers and spotters operate. The number of detector units required depends on the number of key positions to be protected. Each detector will cover an uninterrupted area of from 8,000 to 10,000 sq. ft., being connected to the normal electric light system, and then via the auxiliary gear, wired back to the alarm bell and bomb "locator" in the control room. Immediately incendiary bombs fall on the area protected various detectors will be actuated, ringing the alarm and showing on the "locator" where the bombs are to be found. Thus informed, the controller can dispose his fire-fighting squad to the best possible advantage. No bombs remain undetected to cause major conflagrations. Also, bombs in vulnerable places such as pattern shops, wood stores, paint sheds, etc., can have more men concentrated on them than those which fall in less vulnerable places such as loading yards, concrete roofs, etc.



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Control of Iron and Steel

NEW PROCEDURE UNDER (No. 15) ORDER

The Control of Iron and Steel (No. 15) Order, 1941, which came into force on Thursday, July 17, revokes the Nos. 8, 10, 11, 12 and 13 Orders, i.e., all Orders in force dealing with iron and steel supplies.

Although the form of the Order has been changed considerably, by the incorporation in the body of the Order of the provisions which were formerly set out in a separate Direction, the principles are unchanged but for the following important additions:—

(1) The incorporation in the Distribution of Steel Supplies Scheme of all iron products (except pig-iron) from September 1 next.

(2) The prohibition of the treatment, use and consumption of iron and steel in the production, repair or maintenance of articles not controlled under this Order or for the construction, alteration or repair of any building, without authority to treat, use and consume; and

(3) The limitation in quantity and value of purchases which may be made without authority by any one quarter.

Exemptions from Licence

To deal with the Order in detail, Article 1, which in the No. 8 Order prohibited the acquisition and disposal of the iron and steel raw materials and products set out in the First Schedule except by or to a licensed purchaser, now deals only with acquisition. Acquisition is prohibited with certain exceptions, most of which consist of the exemptions from licence which in previous Orders were contained in Direction No. 1. These exceptions are tabulated in Article 1 as follows:—

Exception (A) contains the main provisions of the scheme for the distribution of steel supplies with the addition of iron products, except pig-iron. The main features of the scheme remain unaltered, although there has been some alteration in wording.

Exception (B) exempts from licence purchases of United Kingdom iron ore, pyrites ash, burnt pyrites residues, manganese ore, boot and shoe grindery and machine staples, when acquired for use in the United Kingdom. In addition, all iron powder and iron powder alloys, except carbonyl iron powder, are free from licence when acquired for use in the United Kingdom.

Exception (C) continues the exemption contained in paragraph 5 (a) of the No. 8 Order, in favour of a merchant acquiring material for sale in turn to a licensed stockholding merchant.

Exception (D) embodies the restriction in quantity and value of purchases without licence from the stock of a stockholding merchant, and Exception (E) contains a similar provision allowing limited purchases of certain products from any source, including stockholding merchants. Suppliers of material under these exemptions should obtain from each purchaser a certificate to the effect that the purchase, together with any other purchases of material of the same category made by the purchaser during the stipulated period, do not exceed the maximum allowed either in quantity or in value. The quantities and values in the certificate must not exceed the quantities and values set out in the Third and Fourth Schedules to the Order. If a purchaser from a stockholding merchant holds a distribution scheme authorisation on Form "M" he must use that authorisation and not purchase under Exceptions (D) or (E).

Exception (F) authorises acquisition by a licensed purchaser or under the authority of a special or general direction issued by the Minister of Supply.

The exemptions from acquisition licences contained in paragraph 4 of Direction No. 1 to the No. 8 Order have been discontinued in view of the transfer of iron to the distribution scheme, although such exemptions are continued until August 31 next, in respect of iron products, except pig-iron. For the same reason the exemption in paragraph 1 of Direction No. 1 to the No. 8 Order has been discontinued. In addition, the exemption from licence of pressings, tanks and cylinders contained in paragraph 1 of Direction No. 1 to the No. 8 Order has been discontinued because of the withdrawal of those articles from control by an alteration made in the First Schedule.

Article 2 deals with the disposal of the materials set out in the First Schedule. No person may dispose of such materials except to a purchaser acquiring under Article 1 or under the authority of a licence.

Treatment and Consumption of Material

Article 3 is a new Article dealing with the treatment, use and consumption of iron and steel as mentioned above. Shortly, the position is that no treatment, use and consumption licence is required if the material has been acquired by means of a distribution scheme authorisation on Form "M" or by Iron and Steel Control licence or under the other exceptions contained in Article 1. In addition, where material is not acquired by a consumer, but that consumer holds an authorisation on Form "M" to acquire, he can treat, use or consume material produced or owned by him for the purpose mentioned in the authorisation without a treatment, use and consumption licence.

Article 4 provides for the fixing of maximum prices in the same way as Article 2 of the No. 8 Order. Article 5 is similar to Article 3 of the No. 8 Order.

Article 4 of the No. 8 Order, which provided for the furnishing of returns, the keeping of books, etc., and for the inspection of works, has been omitted, as these powers are now contained in the Information and Records (Industry) Orders. The remaining Articles in the new Order are similar to Articles appearing in the No. 8 Order with consequent alterations.

No stockholding merchant may acquire material under the Distribution Scheme (see Exception (A) to Article 1) or iron under paragraph 4 of Direction No. 1 to the No. 8 Order (see the Direction to the No. 15 Order), except when the material is delivered directly from the supplier of the stockholding merchant to a customer of the stockholding merchant. Accordingly, as hitherto, a stockholding merchant may acquire material for stock only if he holds a stock licence from the Iron and Steel Control. A stockholding merchant may not treat, use or consume stock material without a licence to do so.

By heads 4 and 5 in the First Schedule to the Order, control has been extended to cover iron powder, carbon and graphite electrodes and anodes (except illuminating and welding qualities) and petroleum coke. Pressings have been omitted from head 7 so that they are no longer controlled, although, of course, the products required for their production are still controlled. The definition of constructional steel-work has been amended.

The Fifth Schedule to the Order contains, as in previous Orders, a list of maximum controlled prices.

Direction No. 1 (of the Order) authorises the acquisition of iron (except pig-iron) without licence up to August 31, 1941, for the purposes and by the purchasers set out in paragraph 4 of Direction No. 1 to the No. 8 Order, but any such orders outstanding at August 31 and orders placed after that date must be authorised under the Distribution Scheme.

First Schedule

(1) Iron ore (excluding iron pyrites and cupreous pyrites, but including pyrites ash and burnt pyrites residues whether in briquetted or other form).

(2) Manganese ore; ore, concentrate or residue containing molybdenum or vanadium.

(3) Ferro-alloy of any kind, molybdenum metal, calcium molybdate, molyte, bricks and briquetted forms of molybdenum dioxide and of molybdenum trioxide, tungsten metal, tungsten carbide, cemented carbide hard metal, calcium silicide.

(4) Powdered iron, alloys of powdered metallic iron with other pure metals.

(5) Carbon electrodes, graphite electrodes and graphite anodes, not being illuminating or welding electrodes or anodes.

(6) Petroleum coke.

(7) Cinder and scale produced during the manufacture or mechanical treatment of iron and steel.

(8) Iron and steel in any of the following forms: Pig; ingot; billet, bloom, slab; tinplate bar, sheet bar; plate, medium plate, sheet (and whether coated or uncoated); angle, channel, tee, joist, piling section, other sectional material (and whether fabricated or not); round, rod, square, hexagon, flat, other section and shape (and whether black or bright); rail, sleeper, fishplate, soleplate; tinplate, terne plate, black plate, silver-finished plate; hoop, strip (and whether coated or uncoated, and whether hot or cold rolled); tube, pipe and standard fittings therefor; tyre, axle, wheel; casting, block for forging, block for pressing, forging, stamping; colliery arch, and accessories therefor, pit prop; bolt, nut, screw stud, washer, rivet, screw; railway spring (and whether laminated or coiled); wire rod; coated or uncoated wire (whether plain or barbed), wire rope, wire strand, wire netting, wire chain link fencing, wire mesh, wire reinforcement fabric mesh, wire rod reinforcement fabric mesh, wire nail, wire staple; or constructional steelwork for inclusion in the structure of a building.

Second Schedule

The Second Schedule consists of the existing list of Symbols and corresponding Government Departments.

Third Schedule

The following are the quantities and values of purchases which may be made without licence in any one quarter without licence from the stock of a stockholding merchant.

Heavy carbon steel products, namely: Plates 3 mm. thick and thicker; sections, joists and bars not included in the re-rolled category below, 10 tons (£125).

Re-rolled and drawn carbon steel and iron products, namely: Sections 4 united inches and under; channels 3 in. web and under; joists under 3 in. web; hoop and strip; rounds, squares and hexagons under 3 in., flats 5 in. wide and under, including spring steel bars, 2 tons (£25).

Sheets, 1 ton (£20). Tinplate, terneplate, blackplate or silver-finished plate, 3 tons 18 cwts., or 39 double boxes (£130).

Baling and strapping wire, 2 tons (£120). Coated or uncoated wire, not being baling or strapping wire, whether plain or barbed, wire strand, wire netting, wire chain link fencing, wire mesh, wire nails, wire staples, 10 cwts. (£40).

Alloy steel ingots, billets, blooms and bars (not including high-speed steel containing 14 per cent. or more of tungsten), 3 tons (£75).

Fourth Schedule

Ferro-alloy of any kind (except ferro-vanadium), 1 ton (£40). Calcium molybdate, 2 cwts. (£40). Molyte, 2 cwts. (£40). Tungsten metal, 2 cwts. (£60). Tungsten carbide, 40 lbs. (£40). Cemented carbide hard metal, 8 lbs. (£40). Calcium silicide, 1 ton (£100).

Iron casting, 2 cwts. (£10).

Bolt, nut, screw stud, washer, 8 cwts. (£40). Rivet, 8 cwts. (£40). Screw, 8 cwts. (£40).

Wire rope, 2 cwts. (£10).

Cast-iron pipes and standard fittings therefor, 1 ton (£20).

Wrought-iron and steel tubes and standard fittings therefor; malleable cast-iron pipe fittings, 10 cwts. (£15).

Fifth Schedule

Maximum prices for iron and steel products in the United Kingdom are set out in the Fifth Schedule, and with the following exception remain unchanged.

Silico-manganese billets, blooms and slabs for re-rolling, both basic and Siemens Martin acid, are increased from £16 5s. to £17 5s. Similar material of acid quality for forging, drop forging and stamping is increased from £16 15s. to £17 15s.

The percentage addition to the prices for cast-iron rainwater and soil goods, gutters and connections, set out in the related schedules, is 21 per cent.

Mild-steel rivets, 4 in. by ¾ in. dia., in 2-ton lots, ex-works, delivered Midland area, reduced from £22 15s. to £22 10s.

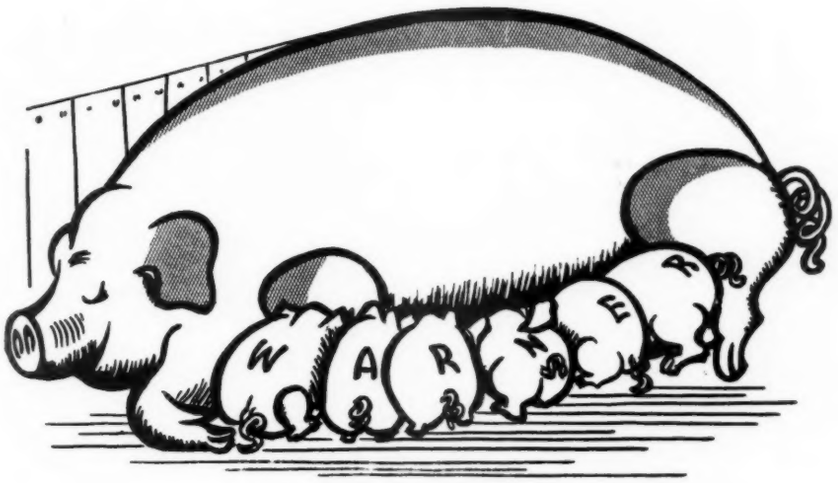
Hot spelter galvanised mushroom roofing bolts and nuts, ¾ in. by ¼ in., ex-works, are priced at 2s. 3d. per gross, and bright gutter bolts and nuts, ¾ in. by ¼ in., ex-works, at 1s. 9d. per gross. These are additions to the schedule.

U.S. Alloy Steel Output

The production of alloy steels in the United States during 1940, under the sharp impetus of the defence programme and British demand, rose to a new peak of 4,966,000 net tons, according to the American Iron and Steel Institute. This output was nearly 60 per cent. over the 1939 production of 3,212,000 tons, and 12 per cent. above the previous peak of 4,432,000 tons produced in 1929.

W

MIGHTIER YET . . .



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At any rate we are producing many analyses which, though they may not be so familiar to the Foundry Trade as our ordinary grades, are helping numerous firms to solve their war-time problems.

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The Week's News in Brief

Trade Talk

LEEDS CITY COUNCIL are to build a coke screening and handling plant at their Meadow Lane Gasworks.

W. F. HAWLEY (FOUNDRY SUPPLIES), LIMITED, is being wound up voluntarily. Mr. F. E. Bendall, King Edward House, New Street, Birmingham, is the liquidator.

THE CARBORUNDUM COMPANY, LIMITED, Trafford Park, Manchester, inform us that the London office address is located at 3 and 4, Parkfield Parade, High Road, Ickenham, Middlesex (telephone, Ruislip 3586).

THE PARTNERSHIP between Messrs. Ernest James Daniels and William George Warmington, carrying on business as designers and manufacturers of jigs, gauges and press tools at Alcaster Road, Hollywood, Worcester, under the style of Southern Jig & Tool Company, has been dissolved. Debts will be received and paid by Mr. William George Warmington, who will continue to carry on the business under the same style.

ARRANGEMENTS have been made for a joint meeting of the Newport and District Metallurgical Society and the Iron and Steel Institute to be held on Saturday, July 26, at 6.15 p.m., at the Newport Technical College, Newport, Mon, when Principal C. A. Edwards, D.Sc., F.R.S., will deliver a lecture based on the Paper by himself, Mr. D. L. Phillips, M.Sc., and Mr. H. N. Jones, M.Sc., entitled "The Influence of Some Special Elements upon the Strain-Ageing and Yield-Point Characteristics of Low-Carbon Steels," which was printed in the No. II volume of the "Journal of The Iron and Steel Institute" for 1940.

New Companies

(From the Register compiled by Jordan & Sons, Limited, Company Registration Agents, 116 to 118, Chancery Lane, London, W.C.2.)

H. G. Smith (Steel Fabrications), St. Annes Road, Willenhall, Staffs—£4,000. H. G. Smith and A. J. Sherwood.

Miller Chuck Company—£500. A. E. Polatchik and A. Moont, 27, Stamford Hill, London, N.16, subscribers.

Uva Products, Hinckley Road, Burbage, Leics—Engineers, etc. £2,000. S. Warwick, E. Tyson, and R. H. Sarginson.

Avon Engineering Company—£2,000. W. H. Long and R. E. R. Evans, Burmington House, Shipston-on-Stour.

Richard Baxendale & Sons, Albert Street Foundry, Chorley, Lancs—Ironfounders. £7,500. R. and J. Baxendale.

Sebro—Engineers, etc. £20,000. H. O. Short, Trevisquite Manor Farm, St. Mabyn, Cornwall; A. Gouge, and J. H. Wood.

Holgate, Fishwick & Leather—Constructional and general engineers, etc. £8,000. E. A. and G. A. Leather, 15, The Drive, Snedfield, Bury.

British Earthmoving Machinery Company, 166, Bishopsgate, London, E.C.2—Manufacturers of excavating machinery, etc. £3,000. B. Leigh.

John Dore & Company—Coppersmiths and general engineers. £17,000. J. B. Dore, Redholt, Links Way, Northolt; L. J. Dore and O. M. Cheney.

T. A. Lawrence & Company, Bank Buildings, 1-3, Taff Street, Pontypridd—Iron and brass founders, engineers, etc. £500. Ethel and T. A. Lawrence.

Widmet, Widmet Works, Ditton Road, Widnes—Dealers and workers in brass, copper, iron and other metals. £1,000. Major H. H. and J. M. Parkes.

Foundry Query

Jarring and Chemical Balances

We find that the working of a number of pneumatic operated moulding machines in our foundry adversely affects the balances in the laboratory attached, necessitating considerable time in re-setting between weighing. Could you or any of your readers suggest a suitable shock absorption medium to obviate this difficulty? We may say we have experimented with several rubbers to no purpose.—"Chembal."

Obituary

MR. THOMAS FAIRGRIEVE, managing director of Thomas Fairgrieve & Sons, Limited, engineers, Stow, Midlothian, died on July 13, in his 80th year.

MR. FRANK MOORE, managing director of Moore & Wright (Sheffield), Limited, engineers' tool manufacturers, died on July 11, aged 66. He was the founder of the business.

MR. BERNARD CLASEN, managing director of the Columeta Export Company, Limited, died on July 12, at Harrogate, after a short illness. Born and educated in Luxemburg, he came to England at the age of 25 and was actively associated throughout his life with the British and Continental steel industries. In 1907, he was appointed to London to represent and direct the commercial interests of the German Steelworks Syndicate, controlling a large proportion of the steel then being imported into this country from the Continent. This connection ceased at the outbreak of war. In 1914, he was invited to return to Luxemburg to organise the sales of the most important Luxemburg steel-producing concern, ARBED, and became the founder and the first general managing director of Columeta. After a few years' intense activity and world travel establishing this organisation and its branches in all the most important commercial capitals throughout the world, Mr. Clasen returned to England, to the country and people he most admired, as managing director of the Columeta Export Company in London. He played an important *rôle* in the evolution and development of the various international steel associations, seeing in them the basis of a better mutual understanding amongst peoples. Apart from his business activities he ably filled the office of Consul General of Luxemburg. His services to international trade were recognised by France, by Belgium, and by Luxemburg, from whom he received high honours.

Reports and Dividends

Mather & Platt—Interim dividend of 4% (same).

Davies & Metcalfe—Interim dividend of 3% (same).

Crossley Bros.—Deferred ordinary dividend of 5% (same).

Veritys—Profit for 1940, £49,048 (£21,473); dividend of 7½% (6%).

Telegraph Construction & Maintenance—Interim dividend of 5% (same).

Meters—Net profit to March 31, £12,990; ordinary dividend of 9%.

Bennis Combustion—Final dividend of 5%, making 10% for the year.

A. C. Wickman—Net profit for 1940, £59,101; ordinary dividend of 12½%.

Masson Scott & Company—Net profit, £17,848 (£1,216); no ordinary dividend.

George Kent—Final dividend of 7% (6%), plus 2½% bonus (nil), making 12½% (9%).

Wilkes Berger Engineering—Profit for 1940, £38,402 (£14,509); ordinary dividend of 12½% (9%).

Mirrlees, Bickerton & Day—Net profit to March 31, £14,822; dividend of 6% on the ordinary shares; forward, £7,128.

Wm. Denny & Bros.—Profit for 1940, £70,483 (£105,774); to reserve, £30,000 (same); dividend of 10% (same) on the ordinary shares; forward, £7,524 (£15,374).

Mint, Birmingham—Profit, after tax, to March 31, £17,244 (£23,217); depreciation, £6,177 (£6,052); net profit, £7,200 (£13,182); 6% preference dividend, less tax, £2,160 (£2,640); ordinary dividend of 10% (same), £4,000 (£5,000); forward, £6,318 (£5,879).

Thomas Bolton & Sons—Profit, after tax, to March 31, £161,852 (£183,621); depreciation, £70,000 (£64,000); debenture interest, £18,000 (same); preference dividend, £15,000; war contingencies reserve, nil (£30,000); ordinary dividend of 7½% (10%); forward, £77,822 (£58,991).

Hick Hargreaves—Trading profit to March 31, £111,504 (£71,294); tax reserve, £73,700 (£28,298); depreciation, £6,705 (£6,813); war damage insurance, £3,800 (nil); net profit, £27,063 (£37,799); dividend of 7% (5% and bonus 5%); contingency reserve, £8,000 (£12,000); forward, £6,987 (£6,324).

Personal

MR. GEOFFREY CUNLIFFE has joined the Industrial and Export Council as a business member at the invitation of the President of the Board of Trade. He relinquishes his post as Aluminium Controller to the Ministry of Aircraft Production but will be available for consultation.

MR. LINDSAY BURNS, managing director of Henry Balfour & Company, Limited, Leven, and of a number of associated firms, has been appointed local representative of the Ministry of Information. He will lead a small committee to arrange lectures and other M.O.I. work locally.

MR. ASHLEY S. WARD has been appointed the chairman and managing director of Thos. W. Ward, Limited. Mr. George Wood has been appointed deputy-chairman and joint managing director, and Mr. Arnold Carr has been appointed a full director of the company. Mr. Ashley S. Ward has also been appointed the chairman of the Ketton Portland Cement Company, Limited, and Mr. F. R. Stagg deputy-chairman and managing director of that company. Mr. Stagg is also assistant managing director of Thos. W. Ward, Limited.

Contracts Open

Aberdeen, July 28—Brass furnishings, cast iron, malleable iron, etc., for three months, from the Town Council. Mr. T. F. Henderson, city engineer, Town House, Aberdeen.

Chichester—Approx. 100 ft. 5 in. heavy-quality steel tube, flange or screw joints, for the City Council. The City Engineer, Council Offices, Chichester.

Leeds, July 31—Supply and erection of coke screening and handling plant, for the Gas Committee. Mr. C. S. Shapley, engineer, Gas Offices, Market Hall, Leeds, 2.

Tredegar, July 31—Supply and erection of a benzole recovery plant, for the Urban District Council. Mr. W. Walter Davies, enginer, Gas and Water Department, Poplar Road, Tredegar, Mon.

Wigan, August 1—Providing and laying 1,200 yds. of 4-in. dia. cast-iron main, etc., for the Rural District Council. Mr. J. Holding, surveyor, Council Offices, Bank Chambers, Wallgate, Wigan. Fee £1 1s., returnable.)

Injured Steel-Mill Worker

Injured by a load of metal plates which he had attached to the hook of a crane, and which was set swinging by the alleged negligence of the crane-driver, Thomas Gibbons, slinger, of Stockton, received judgment for £713 17s. damages, including £213 17s. loss of wages, against Dorman, Long & Company, Limited, at whose works he was employed.

It was claimed that the defendants were liable because they employed a crane-driver, a youth, who was incompetent and inexperienced with a heavy crane. The defendants denied liability, and alleged that Gibbons was injured because of his own lack of care. The crane-driver denied that he was incompetent, and said he had lifted thousands of loads and remembered only one previous mishap, when his load touched a stack of plates.

Giving judgment, his lordship said it was clearly the duty of the defendants' manager to make some inquiry into the accident which occurred before the one in which the plaintiff was injured. He did not take the trouble to find out anything whatever about the first accident and warn or remove the boy who drove the crane. Three weeks later the boy was guilty of precisely the same negligence, with serious results. The doctrine of common employment did not apply. It was not suggested, in view of recent cases, that the manager was in common employment with the plaintiff. Also, the plaintiff could not be said to be running the risk of the crane-driver's negligence when two trade union agents had seen the manager on his behalf, and had said that neither the plaintiff nor other men were going to run the risk of the crane-driver's negligence. The manager had merely said he was satisfied the boy was all right.

Grinding Wheel Accidents

Answering a correspondent, "The Industrial Accident Prevention Bulletin," suggests ⅛ in. gap between the wheel and rest as adequate for medium and coarse wheels, and 1/16 in. for fine wheels.

Acknowledgments to Manganese Bronze and Brass Co. Ltd., Woodall-Duckham Co. (1920) Ltd., and Hadfields Ltd.

The modern development of refractory materials owes much to close co-operation between manufacturer and user of refractories. As Britain's leading manufacturers, General Refractories enjoy the custom and confidence of many thousands of refractories users engaged in every branch of the metallurgical, engineering and other industries of the world. This intimate relationship is fostered by General Refractories because it provides "G.R." engineers and chemists with a real close-up picture of the actual needs of every type of user. In addition, it provides an invaluable fund of practical experience—which proves the soundest basis on which to maintain and develop a high standard of consistently uniform quality products. This method of procedure is your assurance that there is not only a "G.R." product made for your particular business—but that if you have a problem involving refractories, "G.R." data and experience will help you to find the answer. We want you to feel free to consult the "G.R." Technical Advisory Section at all times. It will enable you to tap this vast organisation for the greater efficiency of your business or plant.

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SILLIMANITE: Tank Blocks, Bricks and Cements.
SANDS: Moulding, Brick Facing, Silica, Glass.

Raw Material Markets

It is inevitable that in present circumstances foundries unsuitable for the production of castings required for the war machine should be poorly situated for business, as the outlets for non-essential iron products have been greatly curtailed by war-time conditions. The light-castings industry finds itself unhappily placed on the whole, and only those works which have been able to adapt their plant to the manufacture of the special needs of Government departments are in a position to operate on a full-time basis. Makers of heavy castings continue to receive as much work as they can tackle, and gratifying outputs are being recorded among these concerns. Although slightly easier conditions obtain in the steel trade, most sections remain fully occupied. There is need for larger supplies of home-produced scrap metal.

Pig-Iron

MIDDLESBROUGH—Ironmakers in the Cleveland area are solely employed on the production of basic, hematite and refined irons, together with ferro-manganese, so that the requirements of the light-castings industry have to be dealt with by furnaces in Derbyshire and Northamptonshire. Fortunately, deliveries from the Midlands are very satisfactory and are, in fact, more than adequate to meet the restricted needs of consumers, many of whom are on short-time production due to the contraction in the demand for light castings owing to the war. It is unlikely that there will be any material improvement in this section for the duration, as housebuilding operations will naturally be on a small scale during the period of hostilities, and it is not possible to carry on the normal export trade which makers enjoy in peacetime.

While the output of hematite on the North-East Coast is at a very high level, much bigger tonnages than are at present forthcoming would readily be absorbed if it were possible to supply all potential consumers. As it is, distribution is subject to the closest control, and only firms engaged on vital war work are entitled to purchase hematite. Current output is, of course, moving promptly into consumption, and the far-sighted policy of the Control authorities in arranging for the importation of hematite has enabled essential users to maintain steady production, although foreign iron is reserved entirely for high-priority buyers, owing to the expense and the shipping space occupied by hematite brought from overseas. It is hoped that some expansion may soon be made in the local output of hematite, but it is quite certain that this would not bring about any relaxation in the conditions governing distribution.

LANCASHIRE—Demand for special qualities of iron from consumers in the Lancashire area remains on an even keel; consumption is heavy, and ironmasters in the Midlands have received orders for both prompt and forward delivery from users in the North-West. A few users are in the happy position of having stocks on hand, but, generally speaking, these are not extensive and have, of course, been laid down subject to the approval of the Iron and Steel Control, who regulate all transactions under the various Orders issued since the outbreak of war. Very active conditions prevail at all foundries making castings suitable for the use of Government departments, but in certain other directions, notably in the light-castings trade and at jobbing foundries, the volume of work on hand is by no means impressive and does not look like improving for some time to come. Refined grades of iron, which are produced from ores found in the United Kingdom, are being taken up freely, and are being used in many cases as substitutes for hematite, the supply of which falls below needs.

MIDLANDS—Machine tools and heavy castings required for the manufacture of munitions are in great request, and works in this area have as much business on hand as they can deal with. Replacement orders are readily to hand when it is possible to fit in new business. In view of the intense activity among consuming industries demand for low-phosphorus and hematite irons continues to be extremely high and, even with the assistance of imported iron, it is not possible to satisfy all requirements, with the result that many consumers have rearranged their mixtures to exploit the more ample supplies of refined and high-phosphorus irons which can be procured. Although it is not practicable for all works to adopt emergency measures of this nature, where a change in mixtures has been feasible the results in nearly all cases have been highly gratifying. There is no improvement apparent in the conditions of the light-castings trade, which is still under a cloud owing to the many restrictions on the products of the industry. It is scarcely to be expected that these works will see the light of day during the war, but they may be consoled to some extent perhaps by the knowledge that they will be called upon to play an important part in reconstruction after the era of destruction has passed.

SCOTLAND—Industrial workers in the Glasgow district are enjoying a welcome and well-earned respite this week, the occasion of the annual Fair vacation. Production will be resumed more expeditiously than is customary after the celebrations, as in the heavy engineering section, particularly, there is urgent need for full capacity working. Many months of arduous conditions have inevitably caused a certain amount of plant deterioration, and the opportunity is being taken this week to carry out repair work and replacements, although here, again, the time occupied by these operations will be less than usual, as as much repair work as possible has been done whilst the machinery has been in operation. Light-castings makers are still only moderately employed, and short time has not been eliminated at several works.

Coke

Demand for coke is on steady lines, and foundries are getting all they require for current consumption. In addition, many of the larger consumers are building up stocks which are likely to assume considerable proportions before the winter arrives, with its tendency to slow down the rate of despatches from the ovens. The f.o.t. price of Durham best coke was increased by 1s. 3d. per ton as from Saturday last, making the current quotation 48s.

Steel

Certain sections of the steel industry have been quieter of late, but this is nothing more than a temporary phase and steelmakers are not diminishing their efforts to return maximum outputs. Government contracts calling for the use of large quantities of steel are regularly being placed, and as soon as existing stocks have been absorbed, pressure on the home producers will quickly be apparent again. Structural engineers appear to be somewhat less keen to obtain fresh supplies of steel, but demands from the shipbuilding industry and other heavy trades continue to be insistent.

Scrap

The Ministry of Supply has announced plans for the recovery of scrap from property damaged by enemy action. It is understood that demolition scrap will henceforth be collected and sorted more rapidly than has been the case so far, and labour, transport and machinery will be specially recruited for the purpose. The installation of oxy-acetylene plants on the sites of bombed buildings is likely to be a feature of the new drive, the object being, of course, to cut up the metal on the spot. It is further reported that a scheme has been devised for the collection of village dumps of scrap metal.

Metals

COPPER—It is believed that consumption of copper in this country is fairly steady, consumers having reached maximum outputs in most instances. It is not, of course, in the national interest to divulge details of consumption of the metal, but it is obvious to all that copper is playing a major part in fulfilling the needs of the war machine. Supplies continue to come forward adequately to meet all essential requirements, but ordinary domestic consumption of the metal has been curtailed severely, and is at a very low ebb. Export licences have been granted slightly more liberally of late, but shipments of copper are still of little consequence. It is felt that the recent larger issue of export permits indicates either an improvement in the supply position or that the Control has deemed it advisable to cover certain orders which would have been met by American producers if the supply situation in the United States were more favourable. In that country copper comes under a complete priority scheme as from August 1 owing to the intense demand for the red metal for the defence programme. Under the scheme civilian consumption will be drastically curtailed. It is expected that new fabricating plants sponsored by the Administration will account for about 30,000 tons of additional copper, these plants being required to deal with home defence orders and also contracts arranged under Lease and Lend aid for Britain. Supplies of Latin-American copper are not arriving in the United States quite so freely as had been anticipated, May arrivals totalling only about 30,000 tons; this is attributed to shipping difficulties. While the American supply position is undoubtedly tight, the priority scheme of distribution should release very large tonnages for war requirements and, taking a long view of the situation, it is likely that there will be an improvement.

TIN—Smelters have again been selling quite freely, and this has been the chief feature of the London market, where a rather quiet tone has prevailed. The ban on exports of tin must be held responsible to a large extent for the absence of more active conditions, while the uncertain political situation in the Far East also tends to restrict trade. Stocks of tin have recently tended to increase and, should this movement be continued, export licences for English tin may again be allocated. At the same time, it is the avowed policy of the authorities here to accumulate really substantial stocks, and it is unlikely that there will be any deviation from this policy whilst conditions in the Far East remain unsettled. News of the subversive activities of the Nazis in Bolivia has interested tin circles in view of the Bolivian wealth of metals, particularly tin. It is felt that the Germans hoped seriously to impede the export of Bolivian metals to the United States and to this country. Fortunately, latest reports from La Paz suggest that the Bolivian Government have the position well in hand.

Tin prices on the London Metal Exchange during the past week have been as follow:—

Cash—Thursday, £257 10s. to £257 15s.; Friday, £258 10s. to £259; Monday, £259 to £259 5s.; Tuesday, £259 to £259 5s.; Wednesday, £258 5s. to £258 10s.

Three Months—Thursday, £260 5s. to £260 15s.; Friday, £261 15s. to £262; Monday, £262 to £262 5s.; Tuesday, £261 15s. to £262; Wednesday, £261 to £261 5s.

SPELTER—As in the case of other non-ferrous metals, the Control authorities are rigidly guarding supplies of spelter, and distribution is much curtailed to other than essential consumers. Supplies for the war machine are satisfactory, and it has lately been possible to issue a few export licences for products containing zinc.

LEAD—Cable and battery makers continue to be the busiest lead consumers, but there is a moderate demand from other directions also. Supplies are readily available and it is still possible to allocate tonnages to users operating outside the war machine. With housebuilding restricted, the call for pipes and sheets is comparatively small, although many Government building projects are in hand.

SCRAP—Due to the forces of competition, scrap merchants' margin of profit is low. Their business is also handicapped by labour difficulties. In most sections of the trade the turnover of metal is substantial.

Blast-Furnace Temperatures

In "Stal," N. JAKUBZINER describes investigations on conditions in the blast furnace in which a correlation was sought between the temperature of the slag measured with a graphite-tungsten thermo-couple and the composition of the pig-iron. A relationship was established between the temperature and the silicon and sulphur in the iron; higher Si and Mn values are obtainable as the S content falls. Both the Si and Mn increase in concentration the longer the iron is left in the stack.